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# Presidents, Politics, And Policy: How The Apollo And Shuttle Decisions Shaped Nasa

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PRESIDENTS, POLITICS, AND POLICY:  
HOW THE *APOLLO* AND SHUTTLE DECISIONS SHAPED NASA

by

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This thesis, submitted by Marc Fusco in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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Title	Presidents, Politics, and Policy: How the <i>Apollo</i> and Shuttle Decisions Shaped NASA
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Marc Fusco  
November 28, 2012

## TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	v
ABSTRACT .....	vi
CHAPTER	
I.    THE ELECTION OF 1960 .....	1
II.   JOHN F. KENNEDY AND THE <i>APOLLO</i> DECISION.....	31
III.  RICHARD M. NIXON AND THE SHUTTLE DECISION .....	106
IV.  THE RECKONING .....	192
BIBLIOGRAPHY.....	230

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To Susan, Jane, and Laura,  
the stars in my constellation

## ABSTRACT

The two most important decisions in the history of NASA after its founding have been John Kennedy's decision to send humans to the moon and Richard Nixon's decision to develop the space shuttle. This study examines the nature of each decision, and illustrates how each decision resulted from a confluence of world events, presidential personalities, and domestic political pressures.

This examination of both primary and secondary historical and policy source materials demonstrates that the individual personalities of each president, especially how each reacted to domestic and international political and economic pressures, played a major role in the formulation of these space policy decisions. Furthermore, the presidential election of 1960 played a critical role in determining the focus of NASA's activities from the early 1960s to this day.

These policy decisions directly shaped the nature of NASA's human spaceflight program in the short term, but had unintended consequences in the long term. While each decision produced spectacular results in the moon landings and in the space shuttle program, each decision affected NASA's ultimate growth and curtailed other space-related projects that had been proposed.

## CHAPTER I THE ELECTION OF 1960

### A Tale of Two Men

America entered the space race in October of 1957 with a shock: global news coverage of the successful launch of the Soviet satellite, *Sputnik*. Reactions to this news around the Western world were nothing short of hysterical, especially in the Western press. President Eisenhower, who secretly launched the American space effort in 1955 when he signed NSC memo 5520 outlining a civilian American space program largely as cover for a more aggressive spy satellite program, had advocated a more moderate space program with a modest budget. His proposals instead focused American space policy on ICBM and reconnaissance satellite development. The *Sputnik* launch, however, changed the whole character of the nascent space race, placing it firmly in the context of the already full-blown Cold War, at least in the eyes of the press, public, and Congress.

Eisenhower remained reluctant to become involved in an all-out race for space supremacy with the USSR, but his hand was forced by political factors, the press, and the public, all of which favored a direct approach to address the apparent space gap. The American President favored a more measured response over a

crash program, whose high costs were anathema to him. Because he supported a civilian rather than a military response to *Sputnik*, the *Vanguard* project was given priority over Wernher von Braun's effort with the Army's Redstone Arsenal. The largely civilian nature of Project Vanguard was a factor in this decision; however, the US Navy was involved, as was Eisenhower's reluctance to rely on von Braun and the former V-2 team—he loathed any dependence on a team of people he considered deplorable Nazis, which was understandable considering his history in the Second World War. Moreover, Eisenhower was concerned with the perception that von Braun's project implied that America had to import rocket expertise from elsewhere. It was only when the *Vanguard* test flight failed spectacularly on live television that the ever-growing pressure from the press, public, and political forces prompted the US to turn to von Braun and his German-born team, now relocated to Huntsville, Alabama. America and von Braun answered the Soviet challenge with the successful *Explorer I* mission on January 31, 1958, and the space race was underway. NASA was formed later that same year, launching America's civil space program under the more modest terms that Eisenhower favored.

A key milestone in the development of the US space program, and one that still affects NASA more than 50 years later, was the US presidential election of 1960. The presidential campaign and ensuing election occurred at the beginning of the US space program, while national space policy was still being debated. It was contested by two public figures who would arguably play the most influential roles in the short- and long-term future of NASA, Senator John F. Kennedy and Vice

President Richard M. Nixon. These men both campaigned vigorously for the position in one of the closest presidential elections in US history. Each man would serve as US president and each, in turn, would have his presidency ended in a national tragedy, albeit one of his own making, in Nixon's case.

These two men competed for the presidency against each other by a strange turn of fate. They had each served as officers in the US Navy during the Second World War, although Nixon did not see combat. Richard Nixon served in the US Congress as a Representative from California from 1947 to 1950, when he was elected to the US Senate, and served as a Senator representing California from 1950 to 1953. Nixon left his Senate seat to serve as Eisenhower's Vice President for two terms. John Kennedy was also elected to Congress in 1946, and served as a Representative from Massachusetts from 1947 to 1953, when he was elected as a Senator from Massachusetts, where he served until he was elected President in 1960. While they served in the House, both were strong anti-Communists and were interested in matters of national defense. They became friends while serving in the House, but this friendship ended during the presidential campaign, and in Nixon's case, turned into hatred after the campaign ended in victory for Kennedy.

Despite the similarities in political views while serving in Congress, the two men had drastically different personalities. Nixon was insecure, secretive, and obsessed with the fact that he did not come from wealth and lacked an Ivy League education; although accepted at Harvard and offered a tuition waiver, family issues forced him to attend Whittier College; he then attended Duke Law

School. By all accounts, Kennedy was a hyper-competitive risk taker who loved to meet and be around people and was largely secure in himself; he came from a fortune, had a father who had been an ambassador to Great Britain, and was educated at the Choate prep school, then Harvard, Stanford, and the London School of Economics. Sid Davis, a reporter who was a friend of Kennedy, summarizes the differences between the two presidents:

I think [Kennedy] was curious about people. . . . If you look at the golfing partners and that sort of thing, they were reporters. He had certain reporters he enjoyed, [such as] Bill Lawrence of the *New York Times*, that he enjoyed being with. They were invited to the White House. A friend of mine, Hugh Sidey . . . wrote for *Time* magazine and had great access to Kennedy. But he loved to have people like that to talk to, and they weren't *all* successful millionaires.

If you look at Nixon's closest associates, they really were very successful businessmen. There was a different attitude, different outlook. Not that that's bad. But he was curious in a different way.<sup>1</sup>

These respective personality traits played large roles in how they governed. Kennedy's penchants for soliciting the opinions of others and risk-taking informed both his personal conduct while President and his decision-making process, which was evident in his decisions during the Cuban Missile Crisis and in his policy decision to pursue a crash lunar landing program, which we will discuss in

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<sup>1</sup> Sid Davis, recorded interview by Vicki Daitch, February 10, 2003, (15-16), John F. Kennedy Library Oral History Program.

depth in Chapter Two. Nixon's desire for secrecy and his tendency to trust only a few people contributed to the Watergate scandal and also influenced his space shuttle policy decision, which we will examine in detail in Chapter Three.

One of the great historical ironies involving these two men lies in their respective views on space and space policy. Evidence suggests that John Kennedy did not understand space science, nor did he show any curiosity toward the subject; yet he spearheaded the largest space project in world history: *Project Apollo*.

Richard Nixon, on the other hand, fully understood space policy and exhibited this knowledge on several occasions, but single-handedly killed the proposed *Apollo* follow-on projects, such as a moon base, Mars mission, and other ambitious space endeavors, and approved a much smaller budget for the space shuttle than NASA desired. How could a President who had little interest in space make the decision to pursue NASA's and the United States' signature space achievement, the moon landings, while a President who was a vocal advocate of space exploration end the grand ambitions of NASA soon after their greatest triumph, and consign human spaceflight to LEO for the next 40+ years?

In order to better understand how the *Apollo* and Shuttle decisions were made and how they have affected NASA in the years since, we must take a close look at each man, the political environments in which each choice was made, and the factors that went into informing each decision. It is only by doing this can we learn how such monumental decisions are made, warts and all, and can use this knowledge to make better decisions concerning the US space program moving forward. This study will examine in depth the rationale for each decision in

historical context, and will evaluate each on its own terms to determine the answer to the question, why was each decision made? However, before we attempt to answer this question by analyzing the individual situations and factors, we must first consider how each man viewed space and space policy before he became President.

### Nixon Before the 1960 Campaign

From the earliest days of the Space Age, Richard Nixon fully understood the implications of the United States' maintaining a leading role in space exploration. On October 4, 1957, the day of the *Sputnik* launch, Vice President Nixon was the first member of the Eisenhower administration to make a public statement on the Soviet feat.<sup>2</sup> Eight days later, in a speech in Oklahoma City on October 12, Nixon restated the Eisenhower administration position when he publicly stated,

It is obvious that we are behind as far as the ability to launch a satellite is concerned . . . but there is a tendency to overestimate what the satellite will do in military power. Russia is not one iota stronger than it was before it put [*Sputnik*] up. As far as the missile field is concerned, we intend to keep the Soviet Union from gaining an advantage, and keeping our advantage.<sup>3</sup>

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<sup>2</sup> Emme in Durant, *Between Sputnik and the Shuttle*, 96.

<sup>3</sup> Emme in Durant, *Between Sputnik and the Shuttle*, 96.

Under withering criticism from the press and political opposition, the administration began to admit that *Sputnik* had a profound effect on the prestige of the US with respect to the USSR. In a speech in San Francisco on October 15, Nixon continued his role as the public mouthpiece for US space efforts by stating,

We could make no greater mistake than to brush off this event as a scientific stunt of more significance to the man on the moon than to men on Earth. We have had a grim warning and a timely reminder of truth; we must never overlook that the Soviet Union has developed a scientific and industrial capacity of great magnitude.<sup>4</sup>

This suggests that the administration was beginning to recognize the geopolitical implications of the *Sputnik* launch (and by extension, Soviet space/military capabilities) as a threat to the US. Moreover, they suspected a domestic threat to the administration. A later speech given in Pasadena in early February of 1958 seems to imply that Nixon not only understood the geopolitical and policy implications of space, but that he might have taken a personal interest in the space program; he told the press that JPL “had not had the credit it deserves for its part in the development of the satellite, *Explorer*. Insofar as the public is concerned, the part played by the Army and its arsenal in Huntsville, Alabama, is well known. I have followed the work at Cal Tech with interest.”<sup>5</sup> Whether this

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<sup>4</sup> Emme in Durant, *Between Sputnik and the Shuttle*, 96. Also Krug, *Space Politics and Policy*, 66, and Krug, *Presidential Perspectives*, 48.

<sup>5</sup> Emme in Durant, *Between Sputnik and the Shuttle*, 97.

interest stemmed from a personal or official capacity is unclear, but Nixon clearly understood the importance of space to the US.

A hint of Nixon's future position on space when President, as well as his tendency towards diplomacy, was on display during a speech he gave while visiting Moscow in 1959 in his role as Vice President:

Let us expand the concept of 'open skies.' What the world needs are open cities, open minds, and open hearts. Let us have peaceful competition, not only in producing the best factories but providing better lives for our people. Let us cooperate in our exploration of outer space. As a worker said to me at Novosibirsk, let us go to the moon together.<sup>6</sup>

Here, Nixon mentions the "Open Skies" concept that Eisenhower had originally put forward at the Geneva Conference of 1955. The proposed policy of allowing each superpower to overfly the territory of the other for reconnaissance purposes was rejected by Krushchev because of the strategic need for Soviet secrecy; it was one of the concepts proposed to enable satellite reconnaissance in NSC 5520, the original US space policy, as "Freedom of Space." Nixon then goes on to advocate open cities, minds and hearts. He seems to suggest here that the two nations' space efforts should make life better on Earth, or at the very least, should take equal priority with improving the lives of the citizens. This impulse toward balancing space efforts with social and civil improvement was a key Nixonian innovation that is discussed at length in Chapter Three. It is also

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<sup>6</sup> Emme in Durant, *Between Sputnik and the Shuttle*, 99.

interesting to note that here Nixon's offer of a joint mission to the moon predates Kennedy's overtures to Krushchev by several years.

The most striking demonstration that Nixon fully understood the political implications of the space program at an early date is his testimony, recorded in the notes from the Greenewalt Committee meeting held on September 23, 1959. The committee, assembled by T. Keith Glennan, the first NASA Administrator, and NASA Deputy Director Hugh Dryden, was composed of non-NASA thought leaders: a group of five business leaders, five scientists, and two academics, Paul Nitze and Walt Rostow. Charged by Glennan and Dryden with determining whether and how to match the Soviet space program (that is, whether or not to race), they appointed Crawford Greenewalt, the CEO of DuPont, as the chairman. The committee's findings are summarized by Walter McDougall in his history *The Heavens and the Earth*, where he remarks that during the meeting of the committee in question,

the debate reached a climax after dinner in the basement of the White House. Vice President Nixon presided. He had studied and listened carefully, and revealed a technical knowledge greater than some of the panelists'. Speaking without notes, Nixon rambled on for forty-five minutes, the august audience listening in confusion, boredom, or admiration to a man who grasped, rightly or wrongly, the political

symbolism of the Space Age. Politics, thought Nixon, had to rank higher than science.<sup>7</sup>

In typical Nixonian fashion, he displayed an understanding of how a space race would play out on the international stage, and of the role that international prestige would play in the years ahead as both the US and the USSR wooed the non-aligned nations of the world. A closer look at the actual hand-typed notes from the meeting reveals much more: a snapshot of exactly how Nixon viewed space at this time. Not only did he understand the foreign-policy implications of a robust space policy, but he foresaw how it would all play out, within the government (both in Congress and in the tension between the military and civilian space programs), with the American public, and internationally. Responding to the question of “what is the importance of prestige to the US, the Vice President answered:

On the matter of organization, there will be a fight in the Congress on this. The Air Force is distressed at NASA attempts to take over space. They will stress the importance of military missions in space. They will point out that it is hard to get funds for pure science. On the other hand, NASA has going for it the tremendous appeal of space. The space effort should be pulled together under one agency. The type of agency best suited to get money would be a combination of military and civilian.

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<sup>7</sup> McDougall, *the Heavens and the Earth*, 204.

As between the scientific and political motivations (political in the international sense), political implications would rate highest.

There will be a drive in Congress to make the US failure in space a reason to vote for more money for space. This could result in the overriding of budgetary considerations. NASA should be thinking how more money could be spent. The motivation will be largely the prestige factor, but the excuse for action will be military implications.

[Kruschev's] current trip [to the US] is having a massive impact. Even so, it is a somewhat transitory impact and covers only one aspect of the problem. The uncommitted nations are thinking about which system could produce the best, the most, the soonest. *Sputniks* have a tremendous impact on the leaders of these nations. The image of a backward country coming up from nowhere has strong appeal. The 1963-66 time period will be critical in international affairs. The USSR will have moved out from our major counter-deterrent. The eyes of the world will be directed toward the competition between the US and USSR. They will be trying to judge which is the system for them. The question will be how many more USSR successes we can stand. The US is clearly on the spot in this time period. We will have to be forthright about our programs. Our case is going to be pretty hard to sell in the face of things Mr. K[rushchev] has said in which he has clearly labeled this a race. This is an issue which will be raised. When combined with the missile problem, with the exploding problems in the underdeveloped countries, we must look at the 2 or 3 years which

could be gained in the space field, not just any 3 years, but as 3 vital, important years.

When the committee suggested that there were priorities other than prestige, such as reducing the missile gap, greater foreign aid, and building bigger boosters, Nixon agreed and continued,

But insofar as other areas are concerned, we must recognize that from a political standpoint, that space and the new world concept captures the imagination. It indicates power; the people do not downgrade the military potentiality of space. I would hope otherwise, but I do not think this is the case. What are we talking about when we talk about firsts in other areas—the cancer cure? This would have impact. Nonlinear mathematics?—space has it all over both of these from an appeal point of view.

I think we can assume that the next administration, whichever party is in power, will have a balanced budget. As far as additional money is concerned, I am afraid that Congress will not put it in foreign aid. They might put it in the military, but I think they will put it in space so that as far as priorities are concerned, this is also a fact. What are the alternatives? . . . We cannot categorically say to the Congress that it is not worth it to spend more in space. It is not a matter of what they might do, but what they are willing to do. If I thought that Congress would support a larger

program in the foreign aid area—dramatically larger—I would trade space for this, but they will not buy it.<sup>8</sup>

Nixon's perceptive read on the politics of space at the Greenewalt committee meeting shows that he supported going head-to-head with the Soviets for reasons of international prestige and believed that Congress would be ready to fund such an effort. He even understood the romantic appeal of space to the human psyche, comparing people's feelings about it to those associated with other potential scientific holy grails, such as a cure for cancer.

### Kennedy Before the 1960 Campaign

By contrast with Nixon's, John F. Kennedy's thoughts about space before the 1960 presidential campaign are harder to categorize. Few of his public statements on the subject have entered the historical record. Instead, we must rely on the accounts of the people who knew Kennedy. The earliest account of Kennedy's opinion on space matters comes from a friend who knew Kennedy as a young senator. Charles Stark Draper, designer of the Apollo Guidance Computer that enabled the moon landings, recounted a dinner in a Boston restaurant with John and Robert Kennedy in the late 1950s in which he was unsuccessful in winning over the young Senator and his brother to an admiration of the wonders of space flight. The Kennedy brothers "treated the ideas with

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<sup>8</sup> Greenewalt Committee Notes, September 23, 1959, NASA History Office.

good-natured scorn” and “could not be convinced that all rockets were not a waste of money, and space navigation worse.”<sup>9</sup> Kennedy’s lack of interest in space matters was perhaps due to his lack of knowledge on the subject. Hugh Sidey believed that of all of the issues that Kennedy would later face as President, he “probably knew and understood least about space,”<sup>10</sup> and Sidey considered this a policy weakness.<sup>11</sup> Jerome Weisner, who became Kennedy’s science adviser, believed that Kennedy had simply not given much thought to space before he became President.<sup>12</sup>

Kennedy was not enticed by the exotic allure of space travel; the thought Kennedy had devoted to space matters as a senator was strictly of a practical nature. Roger Launius describes Kennedy’s approach to space as pragmatic:

He was not a visionary enraptured with the romantic image of the last American frontier in space and consumed by the adventure of exploring the unknown. He was, on the other hand, a cold warrior with a real sense of *Realpolitik* in foreign affairs, and worked hard to maintain balance of power and spheres of influence in American/Soviet relations.<sup>13</sup>

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<sup>9</sup> Murray and Cox, *Apollo*, 45.

<sup>10</sup> McDougall, *Heavens*, 302.

<sup>11</sup> Murray and Cox, *Apollo*, 45.

<sup>12</sup> Murray and Cox, *Apollo*, 45.

<sup>13</sup> Launius, *History*, 55-6.

This assessment is especially intriguing when one considers that, as President, Kennedy employed exactly this type of romantic imagery and emotional appeal to sell his policies, which we will explore in Chapter Three.

John Logsdon's seminal book on John Kennedy and the *Apollo* program presents a telling insight into Kennedy's view of the developing space race in February 1960. In his answer to a college student's letter to him requesting an escalation in the US space program to counter that of the USSR, Kennedy responded that

whatever the scale and pace of the American space effort, it should be a scientific program. . . . In this interval when we lack adequate propulsion units, we should not attempt to cover this weakness with stunts. . . . When this weakness is overcome, our ventures should remain seriously scientific in their purpose. . . . With respect to the competitive and psychological aspects of the space program, it is evident that we have suffered damage to American prestige and will continue to suffer for some time. . . . [O]ur recent loss of international prestige results from an accumulation of real or believed deficiencies in the American performance on the world scene: military, diplomatic, and economic. It is simply not a consequence of our lag in the exploration of space *vis-à-vis* the Soviet Union."<sup>14</sup>

This letter provides evidence that Kennedy understood that the space race should be situated within the larger context of the Cold War, and that he was

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<sup>14</sup> Logsdon, *Race*, 7.

concerned that we lagged behind in booster development, a point that he would repeatedly drive home during the presidential campaign. On the stump, he made multiple claims about a missile gap, which he often linked to space by referring to it as the “missile-space problem.”<sup>15</sup> Kennedy also came out against the space race itself by dismissing it as a series of publicity stunts, and argued that any US space program should be of a scientific nature; he felt that any loss of national prestige was a result of more comprehensive deficits and gaps, not that we trailed the Soviets in space spectacles.

Perhaps the most obvious indication of Kennedy’s lack of personal interest in space comes from the mouth of Kennedy himself. In the preface to the aforementioned book, Logsdon recounts a scene that occurred in the White House cabinet room on November 21, 1962, well after Kennedy’s dramatic challenge to the nation arguing that the US should go to the moon. During a discussion with NASA administrator James Webb concerning budgetary matters, Kennedy frankly admits, “I’m not that interested in space.”<sup>16</sup> This statement, taken in light of the epic pro-space public rhetoric and the immense amount of political capital that Kennedy risked on the moon landing program, is a stunning admission. The lack of personal attraction to the mysteries and intrigue of space exploration places Kennedy’s decision to pursue a moon landing directly into the category of a political move, which we will further discuss in Chapter Two.

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<sup>15</sup> Logsdon, *Race*, 6.

<sup>16</sup> Logsdon, *Race*, xii.

That Kennedy was only interested in space as it related to politics is reinforced by Kennedy aide Ted Sorenson, who explained in 1964,

It seems to me that [Kennedy] thought of space primarily in symbolic terms. By that I mean he had comparatively little interest in the substantive gains to be made from this kind of scientific inquiry. He did not care as much about new breakthroughs in space medicine or planetary exploration as he did new breakthroughs in rocket thrust or humans in orbit. Our lagging space effort was symbolic, he thought, of everything of which he complained in the Eisenhower administration: the lack of effort, the lack of initiative, the lack of imagination, vitality, and vision; and the more the Russians gained in space during the last few years in the fifties, the more he thought it showed up the Eisenhower Administration's lag in this area damaged the prestige of the United States abroad.<sup>17</sup>

While Sorenson's statement seems to contradict Kennedy's view on the scientific importance of space that was stated in the letter to the college student quoted above, it is clear that Kennedy believed that the subject of space mattered politically. Its symbolic value mattered deeply to the public, both in the value of the US space program to world opinion, and in the fact that American deficiencies with respect to the USSR in space matters could be used as a political weapon against the Eisenhower administration and later in the 1960 presidential campaign against Richard Nixon. It is clear that Kennedy had little to

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<sup>17</sup> Theodore C. Sorensen, recorded interview by Carl Kaysen, March 26, 1964, (1), John F. Kennedy Library Oral History Program.

no interest in space itself before he won the office of the presidency in November of 1960. With this understanding of his views on space, it appears at first blush to be very unlikely that Kennedy would spearhead the greatest and most expensive space project in world history.

It is in the context of politics that we can explain how this change occurred in Kennedy's attitudes. Once he decided to embrace a lunar landing program as a political tool, he came to embrace the trappings and benefits of a successful space program, such as being in the company of astronauts and sharing in NASA's successes, if not becoming a space enthusiast himself. Politics can also explain how Richard Nixon, who fully understood the implications of space and advocated a strong US space program, would later put an end to America's ambitions in space by cancelling the final three moon landings and severely curtailing NASA's ambitious plans at the moment of its greatest triumph, even as he personally benefitted from America's space successes. It is ironic that these two men, who arguably would have the greatest effect on NASA and the human spaceflight program for the next 40 years, should meet in the 1960 presidential election.

### The 1960 Presidential Campaign

The 1960 presidential campaign was vigorously contested by two former Navy officers, congressmen, senators, Cold Warriors, and friends. As mentioned previously, it was one of the closest presidential elections in US history, the first

in which general election debates were held, and the first in which television played a major role. The first of the four televised presidential debates was watched by an estimated 66 million viewers (approximately one-third of the total US population of 179 million), considered by multiple commentators to be the most widely viewed presidential debate in history, with a substantial impact on the outcome of the election. Technology had come to influence US presidential politics, and this influence has never waned. Another technology, the US space program, played a role in the campaign, although the role of the space program was not decisive.

While the space race had already captured the imagination of the American people, by 1960 the initial panic over the threat of Soviet domination of space had largely subsided. While the US still did not have a launch vehicle that could match the Soviets', the US had racked up a series of space successes after the initial flurry of disasters and led the USSR in successful missions by an order of magnitude. In his work *Defining NASA*, W.D. Kay notes that "by the end of the decade the launching of satellites had become a familiar enough event (although by no means routine) that some of the deepest fears associated with the *Sputniks* had begun to decline."<sup>18</sup>

John Kennedy, as the challenger from the Democratic Party, ran primarily against the record of the Republican Eisenhower administration, and Richard Nixon, as Eisenhower's two-term Vice President, was forced to defend

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<sup>18</sup> Kay, *Defining NASA*, 61.

Eisenhower while at the same time laying out his own vision of the future of the nation. As the primal fears associated with militarized space receded, the space race also began to fade as a political issue; when space was mentioned during the campaign, it was typically an attack by Kennedy on what he characterized as Eisenhower's lethargic response to early Soviet space victories, and how this perceived weakness affected America's standing in the eyes of the world. This charge was often leveled in the form of an accusation that the Eisenhower administration had allowed the US to fall behind the USSR militarily in what Kennedy described as a missile gap. Logsdon characterizes Kennedy's evolving assault on the Eisenhower space record thus:

Kennedy said little about space issues except in the context of the linkage between space launch vehicles and strategic missile capabilities. That changed once he became the Democratic nominee for President in 1960. The growing disparity in global prestige between the United States and the Soviet Union under the Eisenhower administration became a central theme of JFK's campaign, and the fact that the United States was trailing the Soviet Union in space achievement was frequently cited by Kennedy as very visible evidence of this disparity.<sup>19</sup>

While Kennedy hammered Nixon and Eisenhower for doing too little in space, in typical political challenger fashion he never outlined just how a Kennedy administration space policy would differ (and certainly did not call for a crash-

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<sup>19</sup> Logsdon, *Race*, 6.

program-level mobilization that he would later advocate as President). Rather, his campaign rhetoric suggested “greater activism in space” without describing this “activism” explicitly.<sup>20</sup> It could be argued that the accusation of a failure of the previous administration and allusion to ambitions in space were just political ploys by Kennedy. There is scant evidence that Kennedy planned to pursue a strong space agenda if he won, or pursue a space policy at all.

Space historians also have questioned the intentions behind Kennedy’s space rhetoric. Murray and Cox note that candidate Kennedy referred to a “space gap” along with the missile gap during the campaign, but that Kennedy

remained silent about what he had in mind for his own space program.

Many in NASA had hoped for more. Space flight, and especially manned space flight, had the dash and drama that would have seemed to fit perfectly with the spirit of the Kennedy campaign. But Kennedy was only being honest. At that time, he really wasn’t convinced that manned space flight had a place in his vision of the New Frontier.<sup>21</sup>

There is evidence, however, that what little discussion about the space program during the campaign was political posturing, and perhaps even pandering. When Kennedy campaign journalist Sid Davis was asked years later whether Kennedy talked about the space program while on the stump, he replied,

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<sup>20</sup> Beschloss, in *Myth*, 51.

<sup>21</sup> Murray and Cox, *Apollo*, 44.

The missile gap, yes. He did talk about the missile gap. He talked about the fact that we weren't as strong as we should have been, that we didn't pay enough attention to the strength of the Soviet Union. But at this date, looking back, I'm not sure I can recall, as part of the campaign, whether he discussed the space program in those terms. *He did address it when we were in places where [the members of the audience] were involved in the space program.*<sup>22</sup> [emphasis mine]

Another instance of potential political pandering (or at least playing to an audience) concerning the space program came in response to an open letter published in *Missile and Rockets*, a space industry journal, which solicited each of the candidates' positions on the space program. In a manner similar to what Davis described above, Kennedy responded as follows:

We are in a strategic space race with the Russians, and we are losing. . . . Control of space will be decided in the next decade. If the Soviets control space, they can control earth, as in past centuries the nation that controlled the seas has dominated the continents . . . We cannot run second in this vital race. To insure peace and freedom, we must be first. . . . The target date for a manned space platform, US citizen on the moon, nuclear power for space exploration, and a true manned spaceship should

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<sup>22</sup> Sid Davis, recorded interview by Vicki Daitch, February 10, 2003, (8-9), John F. Kennedy Library Oral History Program.

be elastic. *All of these things and more we should accomplish as swiftly as possible.*<sup>23</sup> [emphasis mine]

Once again, Kennedy plays to his audience; here he suggests an accelerated space program to an aerospace-minded readership.

During his nomination acceptance speech given at the Democratic National Convention on July 15, 1960, Kennedy links space to his vision of the New Frontier:

But I tell you the New Frontier is here, whether we seek it or not. Beyond that frontier are the uncharted areas of science and space, unsolved problems of peace and war, unconquered pockets of ignorance and prejudice, unanswered questions of poverty and surplus. It would be easier to shrink back from that frontier, to look to the safe mediocrity of the past, to be lulled by good intentions and high rhetoric—and those who prefer that course should not cast their votes for me, regardless of party.<sup>24</sup>

However, despite this campaign rhetoric, the first few months of Kennedy's administration saw no mention of or movement to address the issues of space that were delineated so vividly during the campaign. McDougall also suggests

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<sup>23</sup> *Missiles and Rockets*, October 10, 1960, 12-13.

<sup>24</sup> John F. Kennedy: "Address of Senator John F. Kennedy Accepting the Democratic Party Nomination for the Presidency of the United States - Memorial Coliseum, Los Angeles," July 15, 1960.

that this was campaign rhetoric: “For all their ‘space gap’ talk, the Kennedy men had little notion of what to do with the space program after election day.”<sup>25</sup>

In September of 1960, a position paper prepared for candidate Kennedy by physicist Ralph Lapp, veteran of the Manhattan Project, stated that if the US was to compete in a space race against the Soviets, it was imperative that the US land on the moon before their rivals. Lapp argued that such an effort would fulfill more of a political objective than a scientific one, and that “in the psycho-political space race the rewards for being first are exceedingly great,” adding that “there was little payoff for being second.”<sup>26</sup> Kennedy did not advocate this belief during the campaign, or during the first few months of his presidency, but it had been suggested by a prominent person connected to the administration. If Kennedy had read this paper, and we have no evidence that he had, he might have considered it; in any case, Kennedy’s advisors had it on their mind.

It wasn’t just Kennedy who made space a campaign issue, albeit in a minor role. The Democratic Party was of similar mindset, and the Democratic Party platform sought to use what it saw as Republican space race shortcomings as a blunt weapon against Nixon. This was a chance to avenge Republican charges during the 1950s that the Democrats “lost China” to Communism and were weak on foreign policy issues. Seeing an opportunity for a reversal, the Democratic platform stated,

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<sup>25</sup> McDougall, *Heavens*, 308.

<sup>26</sup> Logsdon, *Race*, 9.

The new Democratic Administration will press forward with our national space program in full realization of the importance of space accomplishments to our national security and our international prestige. We shall reorganize the program to achieve both efficiency and speedy execution. We shall bring top scientists into positions of responsibility. We shall undertake long-term basic research in space science and propulsion.<sup>27</sup>

The implications were that the Republicans had not prosecuted the space race against the USSR aggressively enough and had not placed sufficient emphasis on international prestige and science. A later stump speech by Kennedy echoes the charge that the Eisenhower administration lost the opportunity to bolster US international prestige and presided over a decline in world standing:

Because we failed to recognize the impact that being first in outer space would have, the impression began to move around the world that the Soviet Union was on the march, that it had definite goals, that it knew how to accomplish them, that it was moving and we were standing still. This is what we have to overcome, that psychological feeling in the world that the United States has reached maturity. That maybe our high noon has passed . . . and that now we are going into that long, slow afternoon.<sup>28</sup>

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<sup>27</sup> Democratic Party Platform of 1960, July 11, 1960.

<sup>28</sup> Van Dyke, *Pride*, 23.

The linking of a watered-down space program to the international perception of American decline would again rise to confront the American President in the early 1970s, where it was invoked by Casper Weinberger to convince Nixon to approve the space shuttle program. We will discuss this rhetorical linkage fully in Chapter Three.

But a decade earlier, Candidate Nixon was understandably very frustrated by Kennedy's accusations of weakness in the face of Soviet space successes. He knew, as Kennedy would later learn as President, that there was, in fact, no missile gap. Nixon, privy to confidential intelligence information indicating as much, was prohibited from revealing the truth. He therefore bristled at the suggestion that America was a distant second in space to the Soviets, and argued that Kennedy's claims epitomized "irresponsibility of the highest sort for an American presidential candidate to obscure the truth about America's spectacular achievements in space in an attempt to win votes."<sup>29</sup>

This animus took center stage during the final debate between Kennedy and Nixon, held on October 21, 1960. The debate had been scheduled to discuss the matter of American-Cuban relations, but the topic of space was pushed to the forefront when Nixon accused Kennedy of damaging American prestige when incorrectly criticizing our efforts in space and science. Kennedy denied the accusation and quickly turned the discussion to the missile gap and how that affected the perception of the US throughout the world:

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<sup>29</sup> Hardesty and Eisman, *Epic Rivalry*, 108.

Nixon: Now, when we have a presidential candidate, for example--Senator Kennedy-- stating over and over again that the United States is second in space and the fact of the matter is that the space score today is twenty-eight to eight--we've had twenty-eight successful shots, they've had eight; . . . that we're second in science because they may be ahead in one area or another, when overall we're way ahead of the Soviet Union and all other countries in science; . . . when he makes statements like this, what does this do to American prestige? Well, it can only have the effect certainly of reducing it. Well, let me make one thing clear. Senator Kennedy has a responsibility to criticize those things that are wrong, but he has also a responsibility to be right in his criticism. Every one of these items that I have mentioned he's been wrong--dead wrong.

Kennedy: Now I didn't make most of the statements that you said I made.

The s- I believe the Soviet Union is first in outer space. We have-- may have made more shots but the size of their rocket thrust and all the rest--you yourself said to Khrushchev, "You may be ahead of us in rocket thrust but we're ahead of you in color television" in your famous discussion in the kitchen. I think that color television is not as important as rocket thrust. . . . What I said was that ten years ago, we were producing twice as many scientists and engineers as the Soviet Union and today they're producing twice as many as we are, and that this affects our security around the world. And fourth,

I believe that the polls and other studies and votes in the United Nations and anyone reading the paper and any citizen of the United States must come to the conclusion that the United States no longer carries the same image of a vital society on the move with its brightest days ahead as it carried a decade or two decades ago. Part of that is because we've stood still here at home, because we haven't met our problems in the United States, because we haven't had a moving economy. Part of that, as the Gallup Polls show, is because the Soviet Union made a breakthrough in outer space. Mr. George Allen, head of your Information Service, has said that that made the people of the world begin to wonder whether we were first in science. We're first in other areas of science but in space, which is the new science, we're not first.<sup>30</sup>

Space certainly played a role in the presidential campaign of 1960, but it was not a major role, and space exploration was largely used as a political weapon rather than a serious policy issue.

The politicization of space during the presidential campaign of 1960 can be clearly seen when, after Kennedy won the presidency, there was no movement toward accelerating the space program during the transition period. Nor was any action taken during the first three months of the administration—it took several months before a NASA administrator was even appointed. Kennedy did not communicate with NASA at all during the period between the election and the

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<sup>30</sup> "Presidential Debate in New York," October 21, 1960.

inauguration.<sup>31</sup> NASA, eager to follow the lead of the new President, who, they well knew, had criticized the previous administration's indifferent attitude toward space, anxiously looked for guidance from the White House. According to NASA Associate Administrator Bob Seamans, "trying to read the tea leaves in the weeks after the election, it looked as if manned spaceflight was not only not at the top of the new President's agenda, it might not be on the agenda at all. And he was right."<sup>32</sup> Where, during the campaign, Kennedy had suggested that space was a vital area in which we had to vigorously compete with the Soviets as a matter of international prestige, during his inaugural address he called for US-Soviet cooperation in space rather than competing directly, as he also did in his first State of the Union address. At the start of Kennedy's term, space took a back seat to other administration priorities. Only later would it be thrust front and center, following a series of political setbacks to the administration, which we will examine in the next chapter. The evidence suggests that space was not on Kennedy's policy agenda at all. The truth of the matter was that Kennedy was just not interested in space.

This sets up the great irony of early NASA history and policy. John Fitzgerald Kennedy, no lover of space, won the election of 1960 and became the President who drove NASA and America to its greatest space triumph over the Soviet Union. Many historians believe that the *Apollo* lunar landings were the sole events that occurred during the 20<sup>th</sup> century that will be remembered one

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<sup>31</sup> Logsdon, *Race*, 13.

<sup>32</sup> Murray and Cox, *Apollo*, 45.

thousand years from now. Richard Milhous Nixon, space advocate, lost the 1960 election, but went on to win the presidency in 1968 and again in 1972, became the President who shut down the ambitions of NASA, leaving it with an underfunded space shuttle program with no clear mission. What is even more striking is that Nixon, the consummate politician, who presided over the *Apollo* moon landings, personally reaping the political benefits of Kennedy's space legacy—Nixon's name is on the plaques placed on the legs of all of the lunar landers, not Kennedy's—then went on to cancel the last three *Apollo* missions, shut down the *Saturn* assembly lines, cancelled the moon base and Mars mission, and downsized America's role in space, thereby confining NASA's human spaceflight to LEO for the next 40 years.

How did this historical irony occur? Why did each man go against his natural inclinations toward space and act in an antithetical manner after assuming the presidency? How did the two men who met in the presidential election of 1960 go on to become the two most influential figures in NASA's history for the next four decades? The ironies flow from a combination of domestic politics, world events, presidential personalities, and a changing national culture that collided violently during a turbulent ten-year period to shape NASA's future for the next forty years and, most likely, for the foreseeable future. NASA is still influenced by (if not suffering from) the effects of these two men, the men who stood side-by-side on stage at the ABC studios in New York City during the presidential debate in on that day in late October of 1960.

## CHAPTER II

### JOHN F. KENNEDY AND THE *APOLLO* DECISION

John Kennedy's decision to go to the moon remains among the more influential ever made by an American President. It has been extensively chronicled by historians and political scientists alike. Most rightfully attribute the decision to Kennedy's reaction to world events and domestic politics. What changes among the various accounts is the degree to which Kennedy's decision was a rational response to events, or one born out of political desperation.

Kennedy's "space program by fiat" model was an act of political will that was used as a model for later presidents seeking to jump-start an ambitious space program. In particular, George H. W. Bush and George W. Bush, who both failed to reproduce Kennedy's spectacular and historic success in the area of space policy, drew upon the Kennedy model. What the Bushes and other presidents failed to realize was that Kennedy's Apollo decision was not a textbook case of how to marshal political will and spur a nation into action. It was instead a historical and political anomaly, a once-in-a-lifetime event that would likely never again occur.

For many reasons, it is difficult for those who chronicle the moon decision to report on it objectively. The challenges largely arise from the historian's personal

relationship with Kennedy, whether perceived or actual. The historical accounts contain many examples of the Kennedy mythos, and the emotions that this mythos engenders among those who lived through Kennedy's tenure as President and its tragic end seep into the reporting. Kennedy's assassination and the national sorrow it engendered continue to color the way that Kennedy and his presidency are viewed by historians even to this day. Historians know that they must separate the fact from perceptions, and this task is especially difficult in the case of John Kennedy. We are a mere 50 years from the *Apollo* decision and Kennedy's murder, which might not constitute sufficient temporal and emotional distance to allow for the objectivity to which historians strive. Even so, historians have done an adequate job of dealing with Kennedy's *Apollo* decision, but they appear to be more reluctant to attribute elements of the decision to Kennedy's personal failings and less likely to engage in iconoclastic attributions of causes and effects, insofar as these can be determined. (A similar situation exists when assessing Richard Nixon, which we do in Chapter Three, but it arises from the negative feelings engendered by Nixon for those who lived through his terms in office.)

A second factor that can affect the accounts of Kennedy and Nixon is the political philosophy of the historian. While some academics and historians are liberal and others conservative, and their political philosophy informs their opinions of political decisions made by our leaders, that philosophy can also color their interpretations of events and their evaluation of the factors that drove the decisions. A history of the space age written by an admitted liberal like Roger

Launius contains different interpretations of events than does the history written by an admitted conservative like Walter McDougall. As much as historians try to minimize the effects of these factors, historians are human and, as such, subjective creatures.

A great deal of scholarly work has already chronicled the *Apollo* decision, partially due to the enormity of the event and the favored place it inhabits in American history and myth. Another factor that ensures a considerable scholarly output is the simple fact that much of the mundane and official documentation of the actions of the individuals who played parts in the decision have been declassified and made available to the public. We do not focus here on chronicling the series of events that occurred during the first months of John Kennedy's presidency--this has been done far better than I could ever hope to achieve by John Logsdon, Professor Emeritus of Political Science and International Affairs and former director of the Space Policy Institute at George Washington University. Logsdon's *John Kennedy and the Decision to Go to the Moon*, originally written as his doctoral dissertation during the late 1960s, in the midst of Apollo's triumph and filled with interviews of those who were directly involved in the project, was revisited by the author several years ago and republished in 2011, having been updated with the primary source material that had become available to scholars since the original book was written. Logsdon's study will likely serve as the final word on the event and the decision.

We will instead recount the decision on a high level, only to draw a comparison with Nixon's shuttle decision, in an effort to draw a distinction between the

natures of the two decisions. For an in-depth discussion of the chronological chain of events, see Logsdon's seminal book; here, we will touch instead on the role that Kennedy's personality, world events, and domestic politics played in the decision and entertain a discussion of what caused Kennedy to quickly metamorphose from a person who had little interest in the US space program to its greatest advocate.

The launch in 1957 of an artificial satellite by the Soviet Union sent a wave of existential panic throughout the Western world and triggered alarmist fears of impending nuclear attacks from space. The "*Sputnik* moment" seemed to frighten every politician in the US except for President Eisenhower, who, although under siege by his political opposition and the media, reacted in a measured fashion. Eisenhower approved the formation of NASA, and with it, a modest civilian space program, one that he sought largely as a cover for his military space ambitions. Rejecting a large-scale accelerated space program, with the exception of aggressive ICBM and spy satellite development, Eisenhower instead favored a smaller national space program that would grow at a more natural pace, with limited cost to the US taxpayer. This strategy stands in stark contrast to the next President, John Kennedy's, reaction to the successful Soviet feat of putting a man in space on April 12, 1961.

As discussed previously, Kennedy in 1960 campaigned on how his predecessors' policies had resulted in the US losing global prestige to the USSR, a loss that, he argued, was evident in the growing Soviet lead in space capabilities. Kennedy saw an increasing missile gap between the US and USSR,

and claimed that Eisenhower had neglected US capabilities in space to the detriment of the nation. But just three months into his presidency, Kennedy suffered the twin political embarrassments of witnessing a Soviet military officer orbit the Earth before the US had even achieved a ballistic flight into space, followed closely by the Bay of Pigs debacle. Kennedy responded by issuing a challenge to the nation of sending a human to land on the moon and achieving a safe return, and, to raise the stakes, of doing so before the decade ended.

This bold challenge was announced during a special joint session of Congress shortly after the US put Alan Shepard into space for a few minutes, an accomplishment that nonetheless starkly illustrated to the world just how far behind the Americans were in space capabilities. Why did Kennedy choose a risky path that would cost billions and ultimately involve over 400,000 of America's finest minds?

Logsdon's work shows not a young and inexperienced President scrambling frantically to recover lost political capital, as other accounts of the decision have asserted; instead he portrays a rational and deliberate decision maker who took the advice of many trusted experts, sorted through the conflicting views, and determined what he thought would be the best course of action for the nation during the mortal struggle of the West to stem the advance of communism. Going to the moon was not a vanity program of a space enthusiast; indeed, as we have shown, Kennedy himself stated that he was "not that interested in space"—but was instead a vital component of the existential struggle between

the US and the USSR, “part of the battle along the fluid front of the cold war.”<sup>33</sup> Kennedy saw space as an integral part of the Cold War, and saw three ways in which he could prosecute the Cold War—militarily, economically, and technologically. A direct military confrontation was not an option because a nuclear war would prove disastrous for both sides. An economic competition was a possibility, but it would take years to develop to the point where the nonaligned countries would be able to see the difference between the two economic systems; indeed, while it was evident from the 1970s on that the US economy was greatly outproducing that of the USSR, it was not until the early 1990s that the Soviet economy collapsed under the stress of competition and signaled the end of the USSR. That left technology, of which the space program was the marquee feature, as the optimal means of competing with the Soviet Union for the hearts and minds of the world. And Kennedy did not limit this technological “warfare” to the space program—he also desired to compete with Europe and the USSR in developing a supersonic airliner that would surpass the planned jetliners Concorde and the Tu -144.<sup>34</sup>

### The First Months of the Presidency

As a senator, Kennedy’s opinions on space matters were confined to the area of national defense and what he saw as the growing distance between the missile

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<sup>33</sup> Logsdon, *Race*, 227.

<sup>34</sup> Heppenheimer, *Countdown*, 183.

capabilities between the US and USSR—what he termed the “missile-space problem.” At this point in his career during the late 1950s, Kennedy saw space as the domain of the ICBM and saw this “missile gap” purely as a national defense and foreign policy issue: the Soviets’ superiority in missile and space technology simply meant to him that the USSR could rain nuclear-tipped missiles down on the US. This capability would at worst threaten the very existence of the US, and at best tip the tenuous balance of power toward the USSR. The Soviets would thus be able to put some real muscle behind their aggressive foreign policy. In addition, Senator Kennedy had begun to think of the changing balance of technological (as well as military, diplomatic, and economic) power as a means by which the USSR could mitigate American prestige among the uncommitted nations whom both nations were actively courting. This theme of prestige would play a larger role in Kennedy's mind as President.

When he assumed the presidency, Kennedy inherited Eisenhower’s version of NASA and its *Mercury*, *Saturn*, and *F-1* programs; he also inherited NASA’s ongoing plans to go to the moon, which had begun internally in 1959. Kennedy did not visibly change Eisenhower’s approach to a low-key space program. There was one key difference, however. While Eisenhower favored a space program that grew at a natural pace without regard to what the Soviet program did, Kennedy thought of the space program as a tool of diplomacy. During his inaugural address, Kennedy called for superpower cooperation in space when he suggested to the Soviets, “Together let us explore the stars.”<sup>35</sup> Kennedy

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<sup>35</sup> John F. Kennedy, "Inaugural Address," January 20, 1961.

returned to the topic of superpower space cooperation again and again during his presidency, and during his first State of the Union Address, he offered the option of space cooperation with the USSR:

Today this country is ahead in the science and technology of space, while the Soviet Union is ahead in the capacity to lift large vehicles into orbit. Both nations would help themselves as well as other nations by removing these endeavors from the bitter and wasteful competition of the Cold War. The United States would be willing to join with the Soviet Union and the scientists of all nations in a greater effort to make the fruits of this new knowledge available to all—and, beyond that, in an effort to extend farm technology to hungry nations—to wipe out disease--to increase the exchanges of scientists and their knowledge—and to make our own laboratories available to technicians of other lands who lack the facilities to pursue their own work.<sup>36</sup>

While Kennedy did bring up the topic of the US space program in public speeches, there was in fact little activity going on within his administration concerning space during his first several months in office. He did not contact NASA at all during the two-plus months between the election and his inauguration, nor did he propose a NASA administrator.<sup>37</sup> Despite the accusations leveled against the Eisenhower administration during the

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<sup>36</sup> John F. Kennedy, "Annual Message to the Congress on the State of the Union," January 30, 1961.

<sup>37</sup> Logsdon, *Race*, 13.

presidential campaign concerning neglect of the space program and the Soviet lead, the evidence suggests that space policy was a low priority, at best. Linda Krug points to the irony of this situation when she comments, “Interestingly, when Kennedy entered the White House, space exploration was not high on his political or political agenda. Some have even asserted that space was not on Kennedy’s policy agenda at all.”<sup>38</sup> This neglect is remarkable, especially when considering the composition of Kennedy’s cabinet. A number of members of the Kennedy administration, including Vice President Lyndon Johnson (who believed that a focus on space policy would propel him to the White House), were far more disposed to think of US space policy in the terms of the Cold War, than were those of the previous administration.<sup>39</sup> Kennedy’s Secretary of State, Dean Rusk, testified to the Senate Space Committee that he thought the US was in a “space race” against the USSR. He further asserted that he feared the ramifications if the world misinterpreted the current state of the race regarding current US versus Soviet space capabilities as symbolic of America’s limited strategic future.<sup>40</sup>

During the period between the election and the inauguration, NASA did not stand still while waiting for Kennedy to implement the space policy he implied while campaigning. NASA continued development of its ten-year plan, which now included a post-*Mercury* program, named *Apollo*, that sought to land on the moon

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<sup>38</sup> Krug, *Space Politics and Policy*, 66.

<sup>39</sup> Kay, *Defining NASA*, 72.

<sup>40</sup> Kay, *Defining NASA*, 73.

by the late 1960s, and which was identified as a “prime NASA goal.”<sup>41</sup>

Kennedy’s efforts to find a NASA administrator was not a simple task—many who were approached either doubted the future of NASA under the Kennedy administration or did not relish the idea of working with or under Lyndon Johnson who, as Vice President, would be head of the National Space Council. Kennedy finally settled on James Webb, which was an inspired choice; Webb was arguably the best administrator that NASA ever had, possessing the right mixture of administrative talent and political savvy.

Logsdon portrays Kennedy as a thoughtful and open-minded decision maker, one who did not seem averse to changing his mind in the light of compelling information that ran contrary to his opinion. In the weeks after his inauguration, while Kennedy considered a modest increase in the NASA budget that he inherited from Eisenhower, he sought input from several sources because he was concerned that a budget increase for the *F-1* engine and *Saturn* program might not result in increased US prestige.

Kennedy’s science advisor, Jerome Weisner, strongly opposed what was then called “manned” spaceflight. Weisner instead favored science-based missions carried out by instrument packages and robotic probes. However, in March of 1961, the National Academy of Sciences advocated a lunar landing as the ultimate objective of the US space program.<sup>42</sup> (This endorsement seems to have had an influence on Kennedy’s decision several months later to call for an effort

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<sup>41</sup> Emme in Durant, *Between Sputnik*, 46.

<sup>42</sup> Logsdon, *Race*, 53.

to land a human on the moon, but to what extent is difficult to determine.) What is clear is that Kennedy had seen the overwhelming public support for the Mercury program and realized that he needed to support it in an effort to coopt the political goodwill it engendered.<sup>43</sup> But it was not a decision made without political calculation. Historian Roger Launius describes Kennedy's assessment of the risks: "[*Project Mercury*] was a risky enterprise—what if the Soviets were first to send humans into space, what if an astronaut was killed and Mercury was a failure—and the political animal in Kennedy wanted to minimize those risks."<sup>44</sup>

Also in March of 1961, new NASA administrator Webb wrote Kennedy's budget director, David Bell, to request a 30% budget increase over the limited Eisenhower space budget, citing the need to increase U.S. international prestige through a robust space program. Webb and Bell met in the White House to discuss whether the President should commit to an aggressive and more expensive space program, one that included a lunar landing. Bell disagreed, reasoning that it was folly to run a race that we would probably lose anyway, and that Kennedy had more important issues to worry about. While the administration did not support the accelerated program, they approved a modest budget increase to develop a more robust heavy-lift capability, which would eventually enable a lunar landing.<sup>45</sup> During the heated discussions between NASA and the Bureau of the Budget (BoB), NASA Deputy Administrator Hugh Dryden made a prophetic statement. After being told that Kennedy did not have

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<sup>43</sup>Launius, *History*, 57.

<sup>44</sup>Launius, *History*, 57.

<sup>45</sup>Launius, *History*, 58-9.

time to personally address a NASA budget increase request, Dryden told Bell, “You may not feel he has the time, but whether [Kennedy] likes it or not he is going to have to consider it. Events will force this.”<sup>46</sup>

### The Events of April-May, 1961

Those events occurred less than a month later, on April 12, 1961, when Kennedy received word that the Soviets had successfully launched Yuri Gagarin into orbit. The world media reacted with similar hysteria to that which accompanied the Sputnik launch in 1957, and Kennedy immediately saw this as a political setback for his new administration. Kennedy special counsel Ted Sorenson commented, “Then came the first Soviet to orbit the earth – Gargarin [*sic*] I believe that was – and the President felt, justifiably so, that the Soviets had scored a tremendous propaganda victory, that it affected not only our prestige around the world, but affected our security as well in the sense that it demonstrated a Soviet rocket thrust which convinced many people that the Soviet Union was ahead of the United States militarily.”<sup>47</sup> The newest evidence of Soviet technical prowess was especially damning in light of the charges that Kennedy had made during the presidential campaign that the previous administration had not done enough to compete with the USSR in space. Kennedy now looked guilty of the same

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<sup>46</sup> Logsdon, *Race*, 67.

<sup>47</sup> Theodore C. Sorensen, recorded interview by Carl Kaysen, March 26, 1964, (1-2), John F. Kennedy Library Oral History Program.

charge. Michael Beschloss suggests that Kennedy was not politically concerned over the Gagarin flight; he contends that Kennedy understood that he would not be held widely accountable for this latest example of Soviet space superiority, having only been in office for three months—hardly enough time to put his own space policy in place.<sup>48</sup> Other historians, however, argue that “the specter of another Soviet space triumph haunted Kennedy and his advisers.”<sup>49</sup> The event certainly forced Kennedy to circle back to the US space program, and raised the level of importance of the issue of the inferior position that the US occupied in the space race and its implications on world opinion. But Kennedy was not yet ready to enter an all-out race.

Krushchev characteristically played up this event as a victory for world communism over moribund capitalism. Kennedy sent a congratulatory telegram to the Soviet premiere, using the occasion to again suggest space cooperation between the superpowers:

THE PEOPLE of the United States share with the people of the Soviet Union their satisfaction for the safe flight of the astronaut in man's first venture into space. We congratulate you and the Soviet scientists and engineers who made this feat possible. It is my sincere desire that in the continuing quest for knowledge of outer space our nations can work together to obtain the greatest benefit to mankind.

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<sup>48</sup> Beschloss, in *Myth*, 56.

<sup>49</sup> Hardesty and Eisman, *Epic Rivalry*, 119.

JOHN F. KENNEDY

[N. S. Khrushchev, Chairman, Council of Ministers, Union of Soviet Socialist Republics]<sup>50</sup>

It is clear that in the immediate aftermath of the Gagarin flight, Kennedy had not yet decided to go head-to-head against the Soviets in space. A press release published on the same day by the White House press office hails the feat as a technological, but not a political, triumph:

THE ACHIEVEMENT by the USSR of orbiting a man and returning him safely to ground is an outstanding *technical* accomplishment. We congratulate the Soviet *scientists and engineers* who made this feat possible. The exploration of our solar system is an ambition which we and all mankind share with the Soviet Union and this is an important step toward that goal. Our own Mercury man-in-space program is directed toward that same end.<sup>51</sup> [emphasis mine]

Kennedy congratulates the Soviet scientists and engineers, revealing that he fully understands the political implications that are in play. These expressions were not an admission of an inferior political or economic system; they were an announcement to the world that Gagarin's flight was merely a technological triumph, one that was shared by "all mankind," and that the US shared the

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<sup>50</sup> John F. Kennedy: "Message to Chairman Khrushchev Concerning the Flight of the Soviet Astronaut," April 12, 1961.

<sup>51</sup> John F. Kennedy: "Statement by the President on the Orbiting of a Soviet Astronaut.," April 12, 1961.

Soviets' ambitions to understand the universe and was, in fact, pursuing their own human spaceflight initiative. Congress quickly jumped into the fray by turning the ongoing NASA budget hearings into an investigation of why Kennedy had not yet increased the budget for manned spaceflight, and seemed primed to increase the NASA budget in order to catch up to and surpass the Soviets. Pressure from Congress added to pressure from the public. Logsdon reports, "Over the next few days, as he absorbed the political reaction in the United States and around the world to the Soviet achievement, Kennedy would change his mind."<sup>52</sup> While seeking to downplay the political implications of the Soviet triumph, Kennedy was beginning to feel this pressure, and he responded by calling a meeting of his top advisors.

On April 14, Kennedy presided over a fateful meeting of his space advisors to determine how best to respond to the Soviet public relations coup. Asked how the US could surpass the USSR in space primacy, Kennedy put the same question to the assembled team. Science Advisor Jerome Weisner suggested that the US focus on communications, meteorological, and navigation satellites, the area in which the US stood the best chance of surpassing the Soviets. Kennedy solicited other opinions from around the table, and the topic soon turned to a manned moon landing.

While a moon landing was deemed technologically feasible, the assembled advisers agreed that the costs would be staggering, and there would be no guarantees that the US could beat the Soviets at the task. *Time Magazine*

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<sup>52</sup>Logsdon, *Race*, 71.

reporter Hugh Sidey, who was present at the meeting, reported that “the main thing everybody was hung up on was the projected cost that might be at the outset as much as forty billion dollars.”<sup>53</sup> While budget director Bell was intimidated by the \$40 billion figure, Kennedy seemed to agonize over the decision, “running his hands through his hair, tapping his front teeth with his fingernails, a familiar nervous gesture.”<sup>54</sup> Logsdon states that attendees at that meeting got the sense that it was then that Kennedy began to see a moon landing as important both to his presidency and to the US in the struggle against the USSR.<sup>55</sup> But while Kennedy was visualizing a moon landing as the way to beat the Soviets, he was still not willing to sign off on the program because in his mind the potential payoff was not worth the cost; during the discussion, he uttered, “the cost—that what gets me.”<sup>56</sup> Kennedy had started to believe that “nothing was more important” than beating the USSR in space capabilities, but was reluctant to spend the nation’s treasure in doing so.

That is, until the Kennedy administration suffered a second political humiliation in a week. The attempted invasion of Cuba at the Bay of Pigs, conducted between April 17-19, 1961, by the CIA and Cuban refugees, failed miserably and very publicly. Although, like the space program, Kennedy inherited the military operation from the Eisenhower administration, the second political debacle in a week shook the new presidency to its core. Historians generally agree that the

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<sup>53</sup> Logsdon, *Race*, 77.

<sup>54</sup> Logsdon, *Race*, 77.

<sup>55</sup> Logsdon, *Race*, 77.

<sup>56</sup> Logsdon, *Race*, 77.

Bay of Pigs fiasco greatly upset Kennedy and filled him with self-doubt. Public opinion questioned whether the young President was up to the task of prosecuting the Cold War. The public fallout for the president was substantial, but Logsdon believes that Kennedy's vulnerable emotional state was a contributing, not a decisive factor in his moon-landing decision.<sup>57</sup>

Beschloss gives us perhaps the most vivid description of the effect of the Bay of Pigs on the Kennedy presidency:

No matter how much Kennedy's aides tried, through background interviews with reporters, to shift the blame for the Bay of Pigs fiasco onto Eisenhower—and they did—Kennedy knew that the debacle had the power to shatter his entire administration. The Bay of Pigs had suggested to Americans that they had elected a President who was at least inexperienced and at worst incompetent. . . . He was desperately in need of something that would divert the attention of the public and identify him with a cause that would unify them behind his administration.<sup>58</sup>

Hardesty and Eisman consider the Bay of Pigs debacle to be a critical influence on Kennedy's view of the US space program: "While the debacle was not cited explicitly as a reason for the Apollo go-ahead, Kennedy clearly sought a new initiative to help restore the nation's tattered prestige."<sup>59</sup> Heppenheimer, too, cites this incident, coming close on the heels of the Gagarin flight, as deeply

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<sup>57</sup> Logsdon, *Race*, 79.

<sup>58</sup> Beschloss, in *Myth*, 56.

<sup>59</sup> Hardesty and Eisman, *Epic Rivalry*, 121.

affecting Kennedy: "This was humiliation. Yuri Gagarin's flight had suggested Soviet strength and American weakness, but here was the real thing," and he goes on to assert that this humiliation caused Kennedy to make "his decision intuitively, knowing the cost would be frightful but accepting that this challenge was one he had to face, then and there."<sup>60</sup> Launius also attributes the acceleration of the space program to these two events: "A nonchalant space program might have remained the standard for the US civil space effort had not two important events happened to force Kennedy to act."<sup>61</sup>

The unfavorable and somewhat panicked world reaction to Gagarin and the Bay of Pigs ultimately convinced Kennedy that "prestige was a real and not a public relations factor in world affairs."<sup>62</sup> As Kennedy came around to the realization that space would be the symbol of the 20<sup>th</sup> century and that the US had to be the leader, rather than being merely a way to score political points during a campaign, he decided that something needed to be done in space. Yet even at this stage, he remained troubled over the costs that would be incurred by a moon landing program.

In search of answers to this crisis of presidential confidence, both from without and within, Kennedy on April 20 asked Lyndon Johnson to prepare a report suggesting options for taking the lead in space from the Soviets. Ted Sorensen recalls:

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<sup>60</sup> Heppenheimer, *Countdown*, 194.

<sup>61</sup> Launius, *History*, 59.

<sup>62</sup> Logsdon, *Race*, 79.

[H]e asked the Vice President [Lyndon B. Johnson], as the chairman of the Space Council, to examine and to come up with the answers to four or five questions of a similar nature: What were we doing that was not enough? What could we be doing more? Where should we be trying to compete and get ahead? What should we have to do to get ahead? And so on. That inquiry led to a joint study by the Space Administration and the Department of Defense.<sup>63</sup>

Kennedy followed up this discussion with a memo formalizing the terms of Johnson's inquiry. The memo, described by Beschloss as being "redolent of presidential panic,"<sup>64</sup> reads as follows:

#### MEMORANDUM FOR THE VICE PRESIDENT

In accordance with our conversation I would like for you as Chairman of the Space Council to be in charge of making an overall survey of where we stand in space.

1. Do we have a chance of beating the Soviets by putting a laboratory in space, or by a trip around the moon, or by a rocket to go to the moon and back with a man. Is there any other space program which promises dramatic results in which we could win?
2. How much additional would it cost?

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<sup>63</sup> Theodore C. Sorensen, recorded interview by Carl Kaysen, March 26, 1964, (1-2), John F. Kennedy Library Oral History Program.

<sup>64</sup> Beschloss, in *Myth*, 57.

3. Are we working 24 hours a day on existing programs? If not, why not?

If not, will you make recommendations to me as to how work can be speeded up.

4. In building large boosters should we put out emphasis on nuclear, chemical or liquid fuel, or a combination of these three?

5. Are we making maximum effort? Are we achieving necessary results?

I have asked Jim Webb, Dr. Wiesner, Secretary McNamara and other responsible officials to cooperate with you fully. I would appreciate a report on this at the earliest possible moment.

John F. Kennedy<sup>65</sup>

Whether the memo truly conveys a state of “panic” is uncertain, but it certainly stresses the urgency of the matter. Considerations related to a moon landing were surely on the President’s mind the next day, April 21<sup>st</sup>, when he was pressed on the matter during a press conference:

Question: Mr. President, you don’t seem to be pushing the space program as energetically now as you suggested during the campaign that you thought it should be pushed. In view of the feeling of many people in this country that we must do everything that we can to catch up with the Russians as soon as possible, do you anticipate applying any sort of crash program?

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<sup>65</sup> John F. Kennedy, “Memorandum to the Vice President- Request for Evaluation of Space Program,” April 20, 1961.

The President: . . . We have to consider whether there is any program now, regardless of its cost, which offers us hopes of being pioneers in a project. It is possible to spend billions of dollars in these projects in space to the detriment of other programs and still not be successful. We are behind, as I said before, in large boosters. We have to make a determination whether there is any effort we could make in time or money which could put us first in any new area.

Now I don't want to start spending the kind of money that I am talking about without making a determination based on careful scientific judgments as to whether a real success can be achieved or whether we are so far behind now in this particular race we are going to be second in this decade.

So I would say to you that it is a matter of great concern, but I think that before we break through and begin a program that would not reach a completion, as you know, until the end of this decade; for example, trips to the moon, may be ten years off, maybe a little less, but are quite far away and involve, as I say, an enormous sum, I don't think we should rush into it and begin them until we really know where we are going to end up. And that study is now being undertaken under the direction of the Vice President.

Question: Mr. President, don't you agree that we should try to get to the moon before the Russians, if we can?

The President: *If we can get to the moon before the Russians, we should.*

[emphasis mine]

Question: Isn't it your responsibility to supply the vigorous leadership to spark up this program?

The President: When you say 'spark up the program,' we first have to make a judgment, based on the best information we can get, whether we can be ahead of the Russians to the moon. We are now talking about a program which may be—which is many years away.<sup>66</sup>

Here the President first mentions the moon landing program publicly and in doing so seems rational rather than panicked. He argues against rushing into such a massive endeavor, and asserts that all aspects of the potential project should be analyzed, especially whether it would be likely to fulfill its objective (which he defines as "being ahead of the Russians to the moon"), before making the decision. He confirms that Johnson is currently working on the analysis.

Johnson, long a space advocate for political purposes, spent two weeks soliciting input from all stakeholders in a typically Johnsonian way—meeting personally with the stakeholders when possible, getting in their faces, twisting arms when necessary. Johnson engaged in the type of personal politics at which he excelled: "Whenever he heard reservations, Johnson used his forceful personality to persuade. 'Now,' he asked, 'would you rather have us be a

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<sup>66</sup> John F. Kennedy, Press Conference, April 21, 1961.

second-rate nation or should we spend a little money?”<sup>67</sup> At Kennedy’s prompting, Johnson put all of his prodigious political gifts to work to drum up support for an expanded space program.

Kennedy’s science advisors, space advisors, NASA, and the Department of Defense (DoD) presented their views to Johnson, and later, other stakeholders such as Congressional leaders did the same. In a foreshadowing of the funding issues that we will discuss in a later chapter, Vice Admiral John Hayward “stressed the need for an integrated, orderly space program rather than an emphasis on one project at the cost of neglecting others.”<sup>68</sup> Hayward’s prophetic statement, which was ignored, pointed to the post-*Apollo* problems that the US space program faced—*Apollo*, because of its singularity of purpose, which was primarily due to the end-of-decade time constraint, used technologies that could not be leveraged for non-lunar purposes and as such, proved an engineering dead end. Ultimately, the stakeholders whom Johnson queried suggested a lunar landing as the optimal way to gain the lead from the Soviets in space and to rebuild America’s lost prestige. They recommended an increased space budget and a marked acceleration of effort. Members of Congress who were consulted responded that “the United States must do whatever is necessary to gain unequivocal leadership in Space Exploration.”<sup>69</sup> Secretary of Defense Robert McNamara explicitly agreed to the idea of going to the moon to increase national

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<sup>67</sup> Beschloss, in *Myth*, 58.

<sup>68</sup> Logsdon, *Race*, 87.

<sup>69</sup> Logsdon, *Race*, 92-93.

prestige. In a memo to Johnson, he said, “What the Soviets do and what they are likely to do are . . . matters of great importance from the viewpoint of national prestige. Our attainments constitute a major element in the international competition between the Soviet system and our own.”<sup>70</sup> In a foreshadowing of the Nixon shuttle decision ten years later, McNamara also opined that an accelerated space effort that would be a gift to the aerospace industry, which was set to suffer under the planned cutbacks in the defense budget.<sup>71</sup>

Space pioneer Wernher von Braun agreed that we should race the Soviets to the moon, but with a caveat; in his written reply to Johnson’s query, von Braun prophetically commented that

in the space race we are competing with a determined opponent whose peacetime economy is on a wartime footing. Most of our procedures are designed for orderly, peacetime conditions. I do not believe that we can win this race unless we take at least some measures which thus far have been considered acceptable only in times of national emergency.<sup>72</sup>

Not all of the stakeholders were on board, however. NASA administrator Webb was reluctant to commit NASA to such an endeavor without first ascertaining whether it was technologically feasible. He also lacked confidence that NASA had the long-term political support such a massive project like a moon landing

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<sup>70</sup> Kay, *Defining NASA*, 73.

<sup>71</sup> Beschloss, in *Myth*, 57.

<sup>72</sup> Letter from Wernher von Braun to Lyndon Johnson, April 29, 1961.

would take—he did not want to set NASA up for failure. A consummate politician himself, Webb understood the nature of the US political system and budget process, and he also understood that NASA needed the administration’s unstinting, long-term commitment and political capital.<sup>73</sup> Science Advisor Jerome Weisner, who argued for the scientific aspects of space exploration over political ones, became “resigned to the inevitable. The decision to go to the moon was ‘a political, not a technical issue,’ as he would later put it, ‘a use of technological means for political ends.’”<sup>74</sup>

Alan Shepard’s flight of May 5, 1961 flight was critical, not just to NASA, but to the Kennedy administration. The administration greatly feared that a failure (especially one on live television) would compound the national humiliation of the twin shocks of Gagarin and the Bay of Pigs. The US had a history of public space failures, and now the stakes had never been higher, especially in the context of international prestige. Several prominent Senators suggested that the flight be postponed and later conducted in secret to mitigate any negative effects of another very public failure.<sup>75</sup> This advice was not heeded, and Shepard’s flight was a success. The fact that it was conducted in public actually worked in favor of the US and against the USSR, which was criticized for their blatant propagandizing of their successes, conducted under a sham cloak of secrecy. Logsdon reports that:

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<sup>73</sup> Lambright, *Powering Apollo*, 96.

<sup>74</sup> Murray and Cox, *Apollo*, 67.

<sup>75</sup> Logsdon, *Race*, 95.

A May 1961 report of the US Information Agency comparing international reactions to the Gagarin and Shepard flights noted that in terms of public reaction, “the US reaped a significant psychological advantage over the Soviet Union.” This was due in large part to the “openness” surrounding the Shepard flight, plus the flight’s “technological refinements and the poise and humility of the US astronaut.”<sup>76</sup>

The resulting perceptible gain in US prestige was probably a major contributing factor in convincing Kennedy to back a push to the moon, since he witnessed the cause-effect relationship firsthand; a failure surely would have prevented Kennedy from making that decision and most likely would have doomed any of the President’s nascent lunar ambitions. Later that day, Kennedy announced at a press conference that the US would next undertake a “substantially larger effort in space.”<sup>77</sup>

Johnson, who was leaving the country for several weeks, passed the task of reporting his findings back to Kennedy on to a team headed by Robert McNamara and that included key members of the DoD and NASA, as well as members of the Bureau of the Budget (BoB). Before he left, Johnson briefed Kennedy on his interim findings in a memo that states, “If we do not make a strong effort now, the time will soon be reached when the margin of control over space and over men’s minds through space accomplishments will have swung so far on the Russian side that we will not be able to catch up, let alone assume

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<sup>76</sup>Logsdon, *Race*, 96.

<sup>77</sup>Logsdon, *Race*, 98.

leadership,” and that a successful moon mission would be an “achievement with great propaganda value” and one in which we would have the possibility of being first.<sup>78</sup> Johnson’s memo to Kennedy addressed the relationship between national prestige and space:

The US has greater resources than the USSR for attaining space leadership but has failed to make the necessary hard decisions and to marshal those resources to achieve such leadership. . . . This country should be realistic and recognize that other nations . . . will tend to align themselves with the country they believe will be the world leader—the winner in the long run. Dramatic accomplishments in space are being increasingly identified as a major indicator of world leadership.<sup>79</sup>

The memo went on to answer Kennedy’s last question, whether the US was doing all it could to take the lead over the Soviets: “We are neither making maximum effort nor achieving results necessary if this country is to reach a position of leadership.”<sup>80</sup>

The team met and reviewed the responses from Johnson’s queries to the various stakeholders. Webb, for reasons already stated, was reluctant to consent to a program as ambitious as a moon landing. But he was eventually persuaded by the others and signed on to the findings.

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<sup>78</sup> Kay, *Defining NASA*, 74.

<sup>79</sup> Johnson, “Memorandum for the President,” April 28, 1961.

<sup>80</sup> Johnson, “Memorandum for the President,” April 28, 1961.

The thirty-page report that emanated from Johnson's and the team's work was authored by McNamara and Webb. It argued that the US should pursue an aggressive space policy that featured a lunar landing by 1970 for the purposes of national prestige, and should abandon the natural progress of the Eisenhower administration approach in favor of a crash program. "Our [space] attainments are a major element in the international competition between the Soviet system and our own. The non-military, non-commercial, non-scientific but 'civilian' projects such as lunar and planetary exploration are, in this sense, part of the battle along the fluid front of the Cold War."<sup>81</sup> The report recommended that the US space program be placed on a war footing and would be accorded the types of resources available only during times of national emergency. The report itself provided four reasons for pursuing a robust space program: scientific research, commercial enterprise, defense, and national prestige. While the US was ahead in the first three categories, the report stated, it lagged behind in the area of prestige. The report conceded that the US was behind in "space spectacles" that bestow prestige in the world community and suggested pursuing a lunar landing program as its focus:

We recommend that our National Space Plan include the objective of manned lunar exploration before the end of this decade. It is our belief that manned exploration to the vicinity of and on the surface of the moon represents a major area in which international competition for

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<sup>81</sup> Webb and McNamara Letter to Kennedy, "Memorandum for the President," May 8, 1961.

achievement in space will be conducted. The orbiting of machines is not the same as the orbiting or landing of man. It is man, not merely machines, in space that captures the imagination of the world.

The establishment of this major objective has many implications. It will cost a great deal of money. It will require large efforts for a long time. It requires parallel and supporting undertakings which are also costly and complex. Thus, for example, the RANGER and SURVEYOR Projects and the technology associated with them must be undertaken and must succeed to provide the data, the techniques and the experience without which manned lunar exploration cannot be undertaken.

The Soviets have announced lunar landing as a major objective of their program. They may have begun to plan for such an effort years ago. They may have undertaken important first steps which we have not begun. It may be argued, therefore, that we undertake such an objective with several strikes against us. We cannot avoid announcing not only our general goals but many of our specific plans, and our successes and our failures along the way. Our cards are and will be face up--theirs are face down.

Despite these considerations we recommend proceeding toward this objective. We are uncertain of Soviet intentions, plans or status. Their plans, whatever they may be, are not more certain of success than ours. Just as we accelerated our ICBM program we have accelerated and are passing the Soviets in important areas in space technology. If we set our

sights on this difficult objective we may surpass them here as well.

Accepting the goal gives us a chance. Finally, even if the Soviets get there first, as they may, and as some think they will, it is better for us to get there second than not at all. In any event we will have mastered the technology. If we fail to accept this challenge it may be interpreted as a lack of national vigor and capacity to respond.<sup>82</sup>

Kennedy received the report on May 8, and two days later, he held a meeting to review the findings. It was at this meeting that Kennedy finalized his decision to go to the moon. He clearly understood that the massive, lengthy, and almost prohibitively expensive effort would likely “reduce our flexibility as a nation to undertake large-scale, all-out efforts in other areas not now foreseen which may suddenly appear to be of comparable national importance.”<sup>83</sup> This was a prescient statement, and later in the decade presented a challenge to President Johnson as he tried to prosecute the Vietnam War and implement Great Society social programs while sustaining the *Apollo* project. Recollecting the formation of the report and the April 10 meeting, Ted Sorensen commented that “Inasmuch as that study was going on simultaneously with the studies and reviews we were making of the defense budget, military assistance, and civil defense, and inasmuch as space, like these other items, obviously did have some bearing upon our status in the world, it was decided to combine the results of all those

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<sup>82</sup> Webb and McNamara Letter to Kennedy, “Memorandum for the President,” May 8, 1961.

<sup>83</sup> Logsdon, *Race*, 79.

studies with the President's recommendations in the special message to Congress."<sup>84</sup>

Kennedy then called a joint session of Congress on May 25<sup>th</sup> to sell his lunar landing program (along with several other elements of the space program) to the Congress, the American people, and the world. The "Urgent National Needs" speech is perhaps Kennedy's most often quoted one, with the possible exception of his inaugural address. (It appears that no book, movie, or television documentary on the US space program starts without a clip from Kennedy's address to Congress or from his later speech at Rice University.) In his televised speech to both houses of Congress and to other dignitaries, given in an environment typically associated with States of the Union addresses and national emergencies such as declarations of war, Kennedy discussed various pressing matters: national defense, economic and social progress at home and abroad, the nature of the Cold War struggle with the Soviet Union. Finally, Kennedy laid out his vision of America's future in space and issued a challenge to the nation. In the May 25<sup>th</sup> speech, Kennedy clearly ties the space program to the larger Cold War, and sets it on a war footing.

Finally, if we are to win the battle that is now going on around the world between freedom and tyranny, the dramatic achievements in space which occurred in recent weeks should have made clear to us all, as did the Sputnik in 1957, the impact of this adventure on the minds of men

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<sup>84</sup> Theodore C. Sorensen, recorded interview by Carl Kaysen, March 26, 1964, (1-2), John F. Kennedy Library Oral History Program.

everywhere, who are attempting to make a determination of which road they should take. Since early in my term, our efforts in space have been under review. With the advice of the Vice President, who is Chairman of the National Space Council, we have examined where we are strong and where we are not, where we may succeed and where we may not. Now it is time to take longer strides—time for a great new American enterprise—time for this nation to take a clearly leading role in space achievement, which in many ways may hold the key to our future on earth.

I believe we possess all the resources and talents necessary. But the facts of the matter are that we have never made the national decisions or marshaled the national resources required for such leadership. We have never specified long-range goals on an urgent time schedule, or managed our resources and our time so as to insure their fulfillment.

Recognizing the head start obtained by the Soviets with their large rocket engines, which gives them many months of lead time, and recognizing the likelihood that they will exploit this lead for some time to come in still more impressive successes, we nevertheless are required to make new efforts on our own. For while we cannot guarantee that we shall one day be first, we can guarantee that any failure to make this effort will make us last. We take an additional risk by making it in full view of the world, but as shown by the feat of astronaut Shepard, this very risk enhances our stature when we are successful. But this is not merely a race. Space is open to us

now; and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share.

I therefore ask the Congress, above and beyond the increases I have earlier requested for space activities, to provide the funds which are needed to meet the following national goals:

First, I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth. No single space project in this period will be more impressive to mankind or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish. We propose to accelerate the development of the appropriate lunar space craft. We propose to develop alternate liquid and solid fuel boosters, much larger than any now being developed, until certain which is superior. We propose additional funds for other engine development and for unmanned explorations—explorations which are particularly important for one purpose which this nation will never overlook: the survival of the man who first makes this daring flight. But in a very real sense, it will not be one man going to the moon—If we make this judgment affirmatively, it will be an entire nation. For all of us must work to put him there.

[Kennedy here then asks for funding for nuclear rocket engines, communications satellites and weather satellites]

Let it be clear—and this is a judgment which the Members of the Congress must finally make—let it be clear that I am asking the Congress and the country to accept a firm commitment to a new course of action, a course which will last for many years and carry very heavy costs: 531 million dollars in fiscal '62—an estimated seven to nine billion dollars additional over the next five years. If we are to go only half way, or reduce our sights in the face of difficulty, in my judgment it would be better not to go at all. . .

Kennedy then appeals to the emotions of the American people who have witnessed first the Sputniks, then Gagarin:

It is a most important decision that we make as a nation. But all of you have lived through the last four years and have seen the significance of space and the adventures in space, and no one can predict with certainty what the ultimate meaning will be of mastery of space.

I believe we should go to the moon. But I think every citizen of this country as well as the Members of the Congress should consider the matter carefully in making their judgment, to which we have given attention over many weeks and months, because it is a heavy burden, and there is no sense in agreeing or desiring that the United States take an affirmative position in outer space, unless we are prepared to do the work and bear the burdens to make it successful. If we are not, we should decide today and this year.

This decision demands a major national commitment of scientific and technical manpower, materiel and facilities, and the possibility of their diversion from other important activities where they are already thinly spread. It means a degree of dedication, organization and discipline which have not always characterized our research and development efforts. It means we cannot afford undue work stoppages, inflated costs of material or talent, wasteful interagency rivalries, or a high turnover of key personnel.

New objectives and new money cannot solve these problems. They could in fact, aggravate them further—unless every scientist, every engineer, every serviceman, every technician, contractor, and civil servant gives his personal pledge that this nation will move forward, with the full speed of freedom, in the exciting adventure of space.<sup>85</sup>

His address on “Urgent National Needs” was pitch-perfect and very well received. Space advocates were both shocked and delighted—“they realized that this was their chance to make their wildest dreams of space exploration come true.”<sup>86</sup> In a manner that was also similar to that which only occurs at times of national emergency, Congress approved Kennedy’s request almost unanimously and “practically without debate,”<sup>87</sup> and dramatically increased

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<sup>85</sup> Kennedy, “Special Message to the Congress on Urgent National Needs,” May 25, 1961.

<sup>86</sup> Hurt, *For All Mankind*, 52.

<sup>87</sup> Van Dyke, *Pride and Power*, 147.

NASA's budget. The US budget for space was increased by 50 percent in 1961. The next year, it exceeded all pre-1961 space budgets combined.<sup>88</sup> Congress, which had already been discussing an appropriate response to Gagarin (and which had been heavily worked over politically by Johnson to reach a consensus in his favor), clearly agreed with the President.

Kennedy had correctly assessed the mood of the nation and harnessed their will to solve the problem of his recent political setbacks. Behind the scenes, Kennedy saw a problem and then sought advice from his team of trusted experts to develop the best solution. However, to the public, Kennedy had a vision for the future of America, which he articulated very well. In the fashion of a true leader, he brought the people to agreement. Logsdon notes, "His commitment captured the American imagination and was met with overwhelming support. No one seemed concerned either about the difficulty or about the expense at the time."<sup>89</sup> In hindsight, it seems like a crazy idea—landing on the moon—especially since Kennedy issued the challenge in an unprecedented public forum at a time when the US had logged a total of just 15 minutes in space, and had yet to put a human into orbit. The daunting risk that Kennedy took speaks to the severity of his political quandary in 1961. The nation was hungry for a large gesture to combat their geopolitical foe, the menacing Soviet bear. Kennedy sensed this mindset, and in an act of supreme leadership, he brought the

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<sup>88</sup> Beschloss, in *Myth*, 61.

<sup>89</sup> Launius, *History*, 65.

American people along with him and showed them a way out of its, and his, predicament.

The idea of landing on the moon fit perfectly into Kennedy's theme of the New Frontier, and it had a certain romance surrounding it, not to mention a quite a large measure of patriotism. In a time of complicated technologies like rocket science, and when considering the difficulties in measuring whether the US, with its lead in successful launches and unmanned exploration, or the USSR, with its success in human spaceflight, were in the lead in space exploration, Von Braun commented on the simplicity, clarity, and elegance of Kennedy's challenge: "Everybody knows what the moon is, everybody knows what the decade is, and everybody can tell a live astronaut who returned from the moon from one who didn't."<sup>90</sup> Once it was selected as the best way to beat the USSR, the selling of the moon landing program to the nation was perfectly executed. Kennedy, NASA, and the nation got their moon landing program.

#### After the Decision

Despite the overwhelming support from Congress and the American people, not everyone was on board with the moon landing program. Kennedy's most notable critic was, understandably, Dwight Eisenhower. Eisenhower had advocated a more organic program that did not compete with the Soviet program for public

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<sup>90</sup> Von Braun, *US News and World Report*, June 1, 1964.

relations victories through space “spectaculars”; as outlined in NSC 5520, he advocated a policy and program that took care of America’s needs, especially those of national defense. He advocated the *Vanguard* program as a civilian cover for the development of reconnaissance satellites and the means to launch them. The launchers would be repurposed ICBMs, whose development would aid in the defense of the nation. After unanticipated humiliation surrounding the fallout from the Soviet Sputnik triumph, Eisenhower began to support *Project Mercury* and NASA, but only as a civilian program (largely to avoid intra-service rivalries and for international optics). To shore up the civilian program, Eisenhower took rocket-related projects from the military, such as part of Army Ballistic Missile Agency (ABMA) in Huntsville (that contained von Braun’s team) and JPL at Caltech, and gifted them to the newly-formed NASA, a civilian agency. He allowed the military to pursue their own space initiatives, however, because Eisenhower knew that the US led the USSR in nuclear technology and would soon lead in ICBMs. The Soviet R-7, while a capable heavy-lift launch vehicle, was a poor ICBM—it was inaccurate, took an inordinate amount of time to prepare for launch, and was produced in numbers too insignificant to pose a threat to the US. Eisenhower also knew that there was in fact no missile gap; he, like Nixon during the 1960 presidential campaign, was prohibited from saying this publicly because the information was classified and of strategic value to the nation. Knowing this, and being a practical and very cost-averse leader, he did not want to spend the huge sums of money required to produce what he considered “space stunts” to compete for illusory international prestige. As such,

he criticized Kennedy's *Apollo* decision over the years in various public forums. In August of 1962, Eisenhower published an article in the *Saturday Evening Post* questioning the moon landing initiative being pursued by Kennedy and NASA.

Why the great hurry to get to the Moon and the planets? We have already demonstrated that in everything except the power of our booster rockets we are leading the world in scientific space exploration. From here on, I think we should proceed in an orderly, scientific way, building one accomplishment after another, rather than engaging in a mad effort to win a stunt race.<sup>91</sup>

Eisenhower was not a believer in reckless national spending (as President, he advocated strengthening America's nuclear capabilities because they were cheaper than conventional forces), and he himself was unjustly attacked by Kennedy and the Democrats during the run-up to the 1960 election over the non-existent "missile gap" issue and accused of putting the nation at risk by allowing the USSR to achieve dominance in space. In 1963, Eisenhower wrote a letter to Republican House Minority Leader Charles Halleck criticizing Kennedy's reaction to Gagarin and Bay of Pigs as "almost hysterical" and immature.<sup>92</sup> During a press conference in April of 1963, Kennedy was asked about Eisenhower's criticism:

Q. Mr. President, General Eisenhower has taken a crack at the national budget. He told Charlie Halleck in a letter that he thought it could be

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<sup>91</sup> Eisenhower, "Are We Headed in the Wrong Direction?," 24.

<sup>92</sup> Kay, *Defining NASA*, 72

reduced by about \$13 billion. The General was especially critical of your space program. He said that there were enormous sums being wasted in that field. Would you care to comment?

THE PRESIDENT . . . the United States Congress almost unanimously made a decision that the United States would not continue to be second in space. We are second in space today because we started late. It requires a large sum of money. I don't think we should look with equanimity upon the prospect that we will be second all through the sixties and possibly the seventies. We have the potential not to be. I think having made the decision last year, that we should make a major effort to be first in space. I think we should continue to do so.

Now President Eisenhower--this is not a new position for him. He has disagreed with this, I know, at least a year or year and a half ago when the Congress took a different position. It is the position I think he took from the time of Sputnik on. But it is a matter on which we disagree.

It may be that there is waste in the space budget. If there is waste, then I think it ought to be cut out by the Congress, and I am sure it will be. But if we are getting to the question of whether we should reconcile ourselves to a slow pace in space, I don't think so.<sup>93</sup>

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<sup>93</sup> Kennedy, "The President's News Conference," April 3, 1963.

In this exchange, Kennedy goes on the offensive against Eisenhower, again blaming him for the US' inferior position in space versus the Soviets and citing his policies as the reason for the need to play catch up, at greater expense. In 1965, the former President complained to astronaut Frank Borman that Kennedy took what Eisenhower considered a well-constructed and balanced space program, featuring a panoply of diverse activities that would benefit the country in many areas, and traded in that approach in a moment of panic in exchange for an all-out competition. Eisenhower felt that the balanced space policy "was drastically revised and expanded just after the Bay of Pigs fiasco. . . . It immediately took one single project or experiment out of a thoroughly planned and continuing program involving communication, meteorology, reconnaissance, and future military and scientific benefits and gave the highest priority—unfortunate in my opinion—to a race, in other words, a stunt."<sup>94</sup> Eisenhower criticized Kennedy's decision publicly and privately. And despite his public defense of it, there is some evidence that Kennedy himself had doubts about his decision to race the Soviets to the moon.

After making his decision, Kennedy never stopped worrying about the costs of the *Apollo* program. The Cold War cooled off noticeably following the Cuban Missile Crisis, and Kennedy began to question whether the cost, nearly 4% of the federal budget, was justified. He revisited the decision several times before his death, each time soliciting his advisors' opinions. In addition, he made several public attempts to defray the costs by suggesting cooperation with the Soviets, at

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<sup>94</sup> Beschloss, in *Myth*, 61.

times even offering a joint US/USSR mission to the moon. Each time, however, Krushchev tied any offers of Soviet cooperation to progress in nuclear disarmament; this was not a realistic proposal because at that time, the US had a decided advantage in nuclear capabilities that it was not willing to surrender. Later gestures to encourage space cooperation by Kennedy were met with Soviet demands to eliminate reconnaissance satellites, which was also unacceptable to the US. In September of 1963, Kennedy told US ambassador to the USSR Foy Kohler that a joint mission to the moon would “save a great deal of expense if we could come to some type of agreement with the USSR on the problem of sending a man to the moon.”<sup>95</sup> At this point, he had begun to see the moon program not only as a means of gaining and maintaining prestige, but as a powerful tool to improve international relations. But Krushchev was not the only opponent of such teamwork in space. In an attempt to head off any cooperation with the Soviets, the House of Representatives passed an amendment to the NASA appropriations bill in early October prohibiting NASA from partnering with “any Communist, Communist-controlled, or Communist-dominated country.”<sup>96</sup> In early November of 1963, Krushchev seemed ready to accept Kennedy’s offer of cooperation, but further negotiations were cut short by an assassin’s bullet on November 22.

That the Apollo decision was never far from Kennedy’s mind is not debatable—there is too much evidence to the contrary to conclude that Kennedy had no

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<sup>95</sup> Logsdon, *Race*, 182.

<sup>96</sup> Kay, *Defining NASA*, 81.

second thoughts about the merits of his decision. In typical Kennedy style, he continued to solicit advice from many people, including other heads of state.

At a state dinner for Tunisia's president Habib Bourguiba the day after Shepard's flight, Weisner was standing in a corner chatting with Bourguiba when Kennedy joined them. 'You know, we're having a terrible argument in the White House about whether we should put a man on the moon,' Kennedy said to Bourguiba. 'Jerry here is against it. If I told you you'd get an extra billion dollars a year in foreign aid if I didn't do it, what would be your advice?' Weisner watched as Bourguiba stood silent for several moments. Finally Bourguiba said, 'I wish I could tell you to put it in foreign aid, but I cannot.' 'Kennedy went around like that all the time, to get a feel for what he was doing,' Weisner said. And the probes kept coming back with the same answer. The United States did not have the option of withdrawing from the space race.<sup>97</sup>

Before he died, Kennedy made a trip to Cape Canaveral to see firsthand the progress that the US space program had made under his watch. The trip took place amid growing public calls to slow the pace of Project Apollo and decrease the NASA budget. During his visit, Kennedy was particularly impressed by the Saturn I vehicle that was being prepared on the launch pad. After learning that the Saturn I would carry a heavier payload than any Soviet booster, Kennedy

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<sup>97</sup> Murray and Cox, *Apollo*, 67.

responded that the US' lead in booster capabilities was "very, very significant."<sup>98</sup>

Under Kennedy's leadership, the US had surpassed the Soviets. Although some historians feel that had Kennedy lived, he would likely have slowed the trajectory of the space program, Logsdon argues against this belief, pointing out that a speech that was scheduled to be delivered by the President on November 22 mentioned that America had no intention of finishing second in space.<sup>99</sup>

Once Kennedy was dead, the moon landing program became, in the minds of the American public, a holy quest, a national obsession, a memorial to their fallen leader. Less than a week after Kennedy's death, President Johnson announced that Cape Canaveral would be renamed Cape Kennedy and that the launch facilities would be called the John F. Kennedy Space Center. Johnson and Webb both at times used political appeals to Congress and others that Apollo should continue because it was a fitting tribute to Kennedy. The image of John Kennedy and the project *Apollo* are still inseparable. Kennedy, a man who had no interest in space, challenged the nation to land a human on the moon and return him safely, then drove the political process of developing the moon landing program to the day of his death. Few Presidential acts since Kennedy's death can match the mastery and sheer force of will that Kennedy exhibited while birthing Apollo, a masterpiece of leadership and political skill that stands as a lesson in leadership to all who follow.

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<sup>98</sup> Logsdon, *Race*, 218.

<sup>99</sup> Logsdon, *Race*, 219.

## Nature of the Decision

Kennedy's decision to race the Soviets to the moon was undoubtedly influenced by the events of April 1961—the triumphant flight of Yuri Gagarin and the tragic events in the Bay of Pigs, Cuba. While NASA had been planning a moon mission, and the Kennedy administration had finally begun negotiating with NASA over a budget increase at this time, there were absolutely no discussions of a crash program to go to the moon to the exclusion of other NASA priorities. Historians and political scientists have their own explanations for why Kennedy decided that a grand action was needed.

The evidence strongly suggests that Kennedy's decision was based on a confluence of factors: international events, domestic politics, and Kennedy's personality. As we discussed in Chapter One, Kennedy was a gregarious man who enjoyed being in the company of others, especially others who were not like him. He filled his administration with Ivy Leaguers, and leaned heavily on them for advice before making a decision. This reliance seems to suggest both self-confidence and insecurity at the same time: self confidence in the sense that Kennedy felt comfortable enough about himself to be seen soliciting advice from various sources without having to constantly assert his power as President; insecure in that he sought the advice of others, and may not have trusted his own instincts as well as he should. Kennedy was a very complex man with a complex personality. While he was alive, his competitive nature was often on display,

including during touch football games on the White House lawn with staff and reporters.

Decades after his death, reports have surfaced of Kennedy's risk-taking personality—he was not a risk-averse person—whether this involved taking chances publicly with the *Apollo* decision or during the Cuban Missile Crisis, or privately during his frequent dalliances and extramarital affairs. As a young man, he had a relationship with a German spy while his father was Ambassador to England and later, while President, an affair with Judith Exner, the girlfriend of mobster Sam Giancana, as well as with various young White House employees. These affairs were conducted with the full knowledge of, and some participation by, Kennedy's staff, the Secret Service and the White House press corps. But unlike during the post-Watergate era, the media observed a code of silence about a sitting president and could be counted on to keep unfavorable facts from the public, whether it be President Roosevelt's confinement to a wheelchair from polio or the playboy lifestyle of John Kennedy before and during his presidency. Stories have emerged describing how Kennedy and members of his staff would frolic in the White House pool with young secretaries and interns, and would be alerted by the Secret Service that Jacqueline Kennedy was arriving at the White House, at which point the women would be escorted hurriedly off the White House grounds. The need for excitement evinced by such behavior may have played a role in Kennedy's decision to take risks during his term. Kennedy also seemed to favor tactics over long-term strategy. This habit of mind is evident in his committing troops to Vietnam without a long-term plan, and also in the *Apollo*

decision—in neither case did Kennedy seem to consider the long-term implications of his decisions, just the immediate or near-term effects. To be fair, this seems to be a weak spot in many modern presidents, not just Kennedy—often, presidential decisions are made only after assessing the political calculus of the effects on their own presidential terms and legacies, and not based on how these decisions will affect their successors or the nation in the long term. Unfortunately, this is one of the major disadvantages of our system of government—that it is run by politicians who make political choices.

Another secret about Kennedy that was kept from the public was his poor health. Kennedy suffered from constant back pain due to his World War II injury in the Pacific, constantly wore a back brace, and was taking painkillers most of the time. He suffered from Addison's disease, which was treated by Kennedy physician Max Jacobson with massive doses of steroids and amphetamines. Jacobson was found to have visited Kennedy at the White House no fewer than 38 times before May 1962, and the FBI found five vials of steroids and amphetamines in the presidential residence. Robert Kennedy became concerned with John's relationship with Jacobson and had fifteen vials tested by the FDA. Jacobson was later found guilty of 48 charges of unprofessional conduct by the New York State Board of Regents' Review Committee. Kennedy was also the first Addison's sufferer to survive surgery when he underwent back surgery in the 1950s. Addison's disease and the unconventional treatments by Jacobson on Kennedy may be an issue in an examination of the push for the moon because, as Oxford University's esteemed *Quarterly Journal of Medicine*

reports, if Kennedy did in fact undergo this non-traditional medical regime, the symptoms of such a treatment would be impetuosity, irritability and tension. All of these psychological side-effects could have affected Kennedy's decision-making process during this time. *QJM* goes on to say, however: "In fairness these [symptoms] were not displayed in his public life, even in the abortive Bay of Pigs invasion of Cuba early in his presidency. His risk-taking seems to have been mainly confined to his private life, such as seeing a Mafia leader's girlfriend in the White House."<sup>100</sup> Whether or not the steroids and amphetamines had an effect on Kennedy's decision-making and, more broadly, his personality, it is likely that a risk-taking thrill-seeker like Kennedy could have been affected by the potent pharmacological cocktail coursing through his system. Yet Kennedy's decision-making abilities did not appear to be impaired during the Cuban Missile Crisis, in which Kennedy displayed a rational coolness that prevented a nuclear war.

The events of April certainly caused Kennedy to act on space policy sooner than he had intended. After using Eisenhower's space policy and alleged failings as a blunt instrument against candidate Nixon during the 1960 campaign, space dropped almost completely off Kennedy's radar for several months. Kennedy clearly did not believe in space exploration as a worthy enterprise in itself, but rather, as a tool to gain and keep American prestige, and he certainly had no personal affinity for it. Space was simply a tool for achieving political ends. It

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<sup>100</sup> Owen, *Diseased*, 330.

was only after the Gagarin flight that Kennedy called for a review of US options in space, and after the Cuban debacle, Kennedy became even more determined to use space as a way out of his predicament. The President had found himself in the same position into which he and the media had placed Eisenhower after Sputnik: “But suddenly it was he, not the gentlemanly general, who was becoming target of restive wrath in Congress and in the press.”<sup>101</sup> The young President was definitely feeling the heat.

Those who were present when the decision was made, or who knew Kennedy, felt that the previously mentioned events had a definite impact on Kennedy. T. Keith Glennan, the first NASA Administrator (he retired in January of 1961) felt that both the Gagarin flight and the Bay of Pigs misadventure were the reason for Kennedy to ask for a “reevaluation” of US space program and policy.<sup>102</sup>

According to Launius, Science Advisor Jerome Weisner believed that the aborted invasion of Cuba “had an impact,” though he was unsure as to how large that impact was on Kennedy; he stated “I think the President felt some pressure to get something else in the foreground” of public opinion a classic case of political misdirection of public attention.<sup>103</sup> Logsdon quotes Weisner as saying, “I think the Bay of Pigs put him in a mood to run harder than he might have.”<sup>104</sup> Weisner, who argued against an accelerated space program in meetings with Kennedy, shared some additional insights into Kennedy’s thought process in an interview

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<sup>101</sup> Burrows, *Ocean*, 321.

<sup>102</sup> Launius, *History of the US Space Program*, 60.

<sup>103</sup> Launius, *History of the US Space Program*, 60.

<sup>104</sup> Logsdon, *Race*, 79.

with Logsdon: "I think he became convinced that space was the symbol of the twentieth century. It was a decision he made cold-bloodedly. He thought it was good for the country."<sup>105</sup> While Weisner recalls that Kennedy was feeling immense pressure after the two events, he still suggests that there was rationality behind the decision. In light of Kennedy's later possible misgivings about the decision before his death, Wiesner's characterization of the decision as "cold-blooded" may be interpreted to connote *hasty* or *without sufficient consideration*. Special assistant to the president Arthur Schlesinger, however, felt that there was a definite link between the events and Kennedy's decision.<sup>106</sup>

Logsdon relates an interesting anecdote that provides some insight as to the nature of Kennedy's space aspirations. After Alan Shepard had been awarded the NASA Distinguished Service Medal by Kennedy at the White House on May 8, the seven *Mercury* astronauts, Kennedy, NASA officials, and other administration figures gathered in the Oval Office. Full of pride and flushed with success over Shepard's flight, Kennedy "gushed with questions" for the assembled NASA personnel. Kennedy announced that he aspired to US space primacy when he announced, "I want to be first."<sup>107</sup> Bob Gilruth, Director of NASA's Space Task Group, which was responsible for human space flight, explained that in order for the US to be first, American engineers would need to do something so difficult that the USSR could not use their existing launch

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<sup>105</sup> Logsdon, *Race*, 83.

<sup>106</sup> Schlesinger, *Thousand Days*, 318.

<sup>107</sup> Logsdon, *Race*, 103-4.

systems—the Soviets would need to build a new launcher from the ground up and would thereby lose their current advantage. Gilruth suggested that going to the moon would require entirely new systems on both sides, and that the US stood a good chance of winning because of that fact. To that, Kennedy replied, “I want to go to the moon.” Gilruth observed to Logsdon that Kennedy “was a young man; he didn’t have all the wisdom he would have had. If he’d been older, he probably would never have done it.”<sup>108</sup> Here Gilruth reflects that Kennedy’s youthful exuberance had a role in his accepting the risky moon landing proposal.

Kennedy confidante Ted Sorensen thought the twin shocks of Gagarin and the Bay of Pigs had the effect of convincing Kennedy of the power of spectacles over the public imagination.<sup>109</sup> Sorensen believed that a risky idea with a dramatic payoff, like a moon landing, appealed to the President’s personality: “The very notion of a manned flight to the moon, as impossible as that seemed, was one that I knew would engage President Kennedy’s keen interest.”<sup>110</sup> While Kennedy had little interest in space before, Sorensen believed that after the Gagarin flight, the President was fully committed to “a race to the moon.”<sup>111</sup> Sorensen later said that Kennedy wanted three things in space: 1) demilitarization; 2) No Soviet monopolization of space; 3) American scientific prestige and effort as priorities. “Those three goals all would have been assured in a space effort which culminated in our beating the Russians to the moon. All three of them would

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<sup>108</sup> Logsdon, *Race*, 103-4.

<sup>109</sup> Harry Hurt, *Mankind*, 52.

<sup>110</sup> Sorenson, *Counselor*, 335.

<sup>111</sup> Logsdon, *Race*, 77.

have been endangered had the Russians continued to outpace us in their space effort and beat us to the moon.” But Sorensen goes on to bring up Kennedy’s later thoughts on space cooperation with the Soviets after the US pulled even with the USSR in space:

But I believe all three of those goals would also have been assured by a joint Soviet-American venture to the moon.

The difficulty was that in 1961, although the President favored joint effort, we had comparatively few chips to offer. Obviously the Russians were well ahead of us at that time in space exploration, at least in terms of the bigger, more dramatic efforts of which the moon shot would be the culmination. But by 1963, our effort had accelerated considerably. There was a very real chance that we were even with the Soviets in this effort.<sup>112</sup>

This seems to suggest that, as discussed earlier, Kennedy began to reevaluate his moon landing mandate in the light of US space parity. Sorensen’s analysis suggests that Kennedy regretted committing the nation to such an expensive undertaking and that, even though the accelerated effort had drawn America even with the USSR in space and in the lead in some areas by the end of his term as President, he was reconsidering that commitment.

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<sup>112</sup> Theodore C. Sorensen, recorded interview by Carl Kaysen, March 26, 1964, (3-4), John F. Kennedy Library Oral History Program.

There is no evidence that James Webb thought Kennedy had been affected by Gagarin or Bay of Pigs.<sup>113</sup> Nor did Lyndon Johnson seem to believe that there was any connection between Kennedy's decision and the events of April 1961. Johnson wrote that Kennedy "never gave the least indication in any of our discussions that he thought there was any relationship."<sup>114</sup> Neither of these figures could be considered impartial sources, however; they were both administration figures with large stakes in an accelerated space effort. Another administration member, Willis Shapley (son of astronomer Harlow Shapley), who worked for the BoB and was part of the decision-making process, recounted:

after having been through quite a few major decisions, there was never a major decision like this made with the same degree of eyes-open, knowing-what-you're-getting-in-for character. President Kennedy, at first uncertain but finally convinced that the United States should accept the Soviet challenge in space, decided that "whatever mankind must undertake, free men must share."<sup>115</sup>

We also have eyewitness accounts of the two journalists we have already mentioned who knew Kennedy personally. Hugh Sidey, who was present at several of the key meetings, later opined that the idea of a risky moon program appealed to Kennedy's personality; the lunar landing "was a classic Kennedy challenge. If it hadn't been started, he might have invented it all, since it

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<sup>113</sup> Lambright, *Powering Apollo*, 94-5.

<sup>114</sup> Johnson, *Vantage Point*, 280.

<sup>115</sup> Logsdon, *Race*, 118.

combined all those elements of intelligence, courage, and tenacity that so intrigued John Kennedy.”<sup>116</sup> Sidey believed that to the President “it was inconceivable that there was no way to accept the challenge and win the race if it was worth it and the country wanted to do it.”<sup>117</sup> This assessment suggests a certain jingoistic naïveté on the part of the President. Reporter Sid Davis in 2003, soon after the *Columbia* accident, commented on how the risky nature of a moon landing challenge appealed to Kennedy’s personality:

That flimsy crate, the lander, was a flimsy piece of machinery. If it didn’t get back in orbit up there, these guys were gone. They were going to be left on the moon. I mean there were a lot of gambles in this thing. That’s still dangerous, as we learned just recently, last week. But Kennedy was a visionary in that sense. *I think it came in those Kennedy genes. They were gamblers. They’re going to do it.*<sup>118</sup> [emphasis original]

Both men knew Kennedy and spent time with him in social situations and on the golf course; they had a good idea of what he was like as a man. They both felt that the courage/risk aspect of the moon program appealed to Kennedy’s psychological makeup.

Few contemporary histories of the decision were written around the time of the moon decision or even during the late 1960s. Of those that exist, two discuss the

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<sup>116</sup> Logsdon, *Race*, 77.

<sup>117</sup> Emme in Durant, *Between Sputnik*, 54.

<sup>118</sup> Sid Davis, recorded interview by Vicki Daitch, February 10, 2003, (57), John F. Kennedy Library Oral History Program.

*Apollo* decision: political scientist Vernon van Dyke's *Pride and Power: The Rationale of the Space Program*, published in 1964, and John Logsdon's *The Decision to Go to the Moon: Project Apollo and the National Interest*, published in 1970 and revisited in 2011.

Van Dyke's book is interesting because it comes right on the heels of the Kennedy presidency and does not have the advantage that time and hindsight affords a historian or political scientist. As such, it is a fascinating look into the thought processes of the time. One must keep in mind that at the time this study was written, America was still a year away from the first *Gemini* flights, and the moon landing was still very much an unknown possibility. The longest spaceflight for an American was Gordon Cooper's 34-hour, 22-orbit *Faith-7* flight in *Project Mercury*—America was still taking its first steps into LEO.

In *Pride*, Van Dyke directly addresses whether the Bay of Pigs had an effect on Kennedy's decision to race to the moon:

Many in the United States, as we have seen, were already smarting under the relatively bad showing of the country in space. NASA officials have cited the Gagarin flight as a factor that helped to sting the country into action. The Cuban failure came a week later, carrying American prestige and pride to a very low point; and it may well have had a sharp impact on the new President personally, because responsibility for the miserable episode was his. Certainly it would not be surprising if his advisers thought that in such circumstances he might be especially likely to

respond to proposals of a bold and dramatic sort, with considerable potential appeal, and if in fact the circumstances did affect his attitudes. Such speculations may or may not ever be confirmed.<sup>119</sup>

Van Dyke goes on to discuss the types of grand gestures in space that the Kennedy team could have alternately selected:

It is arguable (though doubtful) that we could gain deference more surely by stressing the development of capabilities in near space—especially military capabilities—than by stressing a lunar landing. It is also arguable that other goals are more important than the attempt to enhance prestige by beating the Russians to the moon. But for prestige purposes it would be hard to imagine any national achievement in space that would have a value comparable to a successful manned lunar mission and return to earth—unless it be a manned exploration of Mars.<sup>120</sup>

The moon landing was still seen at this time as the essential act needed to combat the Soviets in space; however, it was still viewed as a unitary act rather than as a complex technological feat, with tens of thousands, if not millions, of elements, variables, and procedures, all of which needed to function correctly.

Van Dyke ascribes the decision to go to the moon as one dominated by national pride, which had been bruised by *Sputnik*, then Gagarin and the Bay of Pigs; the moon program decision was one of foreign policy, although a foreign policy

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<sup>119</sup> Van Dyke, *Pride and Power*, 166.

<sup>120</sup> Vernon Van Dyke, *Pride and Power*, 135.

decision that relied primarily on technological means for resolution: “The evidence is abundant that the complex of values here identified with pride was a powerful factor in influencing the President and Congress to expand and accelerate the space program in the spring of 1961, and that it has remained an important factor ever since.” Unfortunately, Van Dyke’s account follows the events too closely in time for him to be afforded access to the inner workings of Kennedy and his advisors. The documents he needed to make his case were still classified as secret.

Logsdon’s original version of *The Decision to Go to the Moon* cites Van Dyke’s book as a stimulus for choosing the moon landing decision as the topic for his doctoral dissertation. Logsdon had the good fortune of interviewing many of the people who were directly involved with the Apollo program and who had access to many of NASA’s resources, so he is able to give us an inside view of the decision-making process. One mistake that Logsdon makes, however, is claiming that understanding how the *Apollo* decision was made can lead to a better understanding of how to influence those type of decisions in the future. The *Apollo* decision was a unique decision made during unique circumstances; a similar situation will probably never be repeated. As discussed earlier, “space exploration by presidential fiat” was a misrepresentation of the genesis of the *Apollo* program and although it has been tried by other presidents, all of them have failed.

In any case, Logsdon’s book was a vital analysis of the Apollo decision, and the insights it provides form the basis for how we understand the decision that

Kennedy made. Any serious discussion of the decision since the early 1970s cites this reference, which remains the seminal account of the event, only eclipsed by Logsdon's own revision. The second edition fills out the narrative on the Kennedy administration side with primary source material, such as administration memos, letters, and recorded conversations documenting the actual turn of events, items that were not available to researchers or the general public at the time of the writing of the original account. Many of Logsdon's insights in this book have been revisited, illuminated, and placed into context. When discussing Logsdon's take on Kennedy's decision, we will draw from the accounts and sources in his later book.

In a 1979 article for *Astronautics & Aeronautics*, Logsdon makes a very insightful and salient point. Whether the US had ever met its goal in beating the Soviets to the moon by the end of the decade or had failed to achieve this goal, Kennedy's challenge served a more immediate short-term effect. In announcing such a large and audacious ambition, Kennedy thereby neutered the effects of Soviets space successes to come. Unless the Soviets were to land on the moon, their efforts would be measured against America's desire to land on the moon and be found wanting: the proposed moon landing became the measuring stick by which all space activities would be measured. "By entering the race with such a visible and dramatic commitment, the United States effectively undercut Soviet space spectacles without doing much except announcing its intention to join the contest."<sup>121</sup>

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<sup>121</sup> Logsdon, "Apollo Perspective," 112-16.

Modern accounts of the moon landing decision, as we have discussed, have the benefit of hindsight and of more available primary source materials. What will always be missing, however, is a memoir of the period written by the President himself—he never had a post-presidential period of reflection and memoir writing. Such an account surely would have served to help sort out what Kennedy had in fact been thinking, rather than relying on eyewitness accounts, testaments to Kennedy’s character, or primary source documents.

Walter McDougall comes to the conclusion that it is impossible to know what Kennedy had been thinking at the time of the decision. He infers that what “may have tipped the balance for him and for many was the spinal chill of leaving the moon to the Soviets. Perhaps Apollo could not be justified, but, by God, we could not *not* do it.”<sup>122</sup> Kennedy had been placed in a tough situation, but the ramifications of inaction, Soviet mastery of space and world opinion, were worse than the downside of the moon program. (McDougall also asserts that Kennedy fell prey to his liberal belief that certain behaviors should be subject to political control, resulting in large, technocratic projects moving from the military into the private realm.) Kennedy thought of himself as a man of action—W.D. Kay notes that during the presidential campaign of 1960, Kennedy wanted to impress this idea on the populace. Perhaps to counter any claim that Kennedy was too young and inexperienced for the White House, he turned his youth and energy into an advantage as he campaigned (one wonders how much of this was compensation for Addison’s Disease, which sapped his energy). “Kennedy was a younger man

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<sup>122</sup> McDougall, *Heavens*, 324.

[than Eisenhower] who wished to convey an impression of vigor and vitality. He campaigned on a pledge to ‘get America moving again.’<sup>123</sup> This image stood in stark contrast to the previous administration, which Kennedy painted as old and slow-moving. Kennedy promoted a public persona of dynamism and forward thinking, and the *Apollo* decision was a dynamic, dramatic, and forward-thinking gesture. Moreover, Kennedy could not *not* do anything, especially after he spent months criticizing Eisenhower of inaction and now found himself in a similar predicament to that of the elderly general.

Other historians have also agreed that Gagarin and the Bay of Pigs had a definite effect on the decision. J. Henry Lambright feels that the twin events of April 1961 forced Kennedy’s hand. “Although no explicit evidence links the Bay of Pigs to Kennedy’s actions on space, the fiasco created an atmosphere in the White House in which the President felt he had to exert leadership right away.”<sup>124</sup> Nathan Goldman believes this to be the case, and argues that the events forced Kennedy to look seriously at US space efforts. While Kennedy campaigned on missile and space issues, he did little on either once in the White House. It was “only after the Gagarin flight did Kennedy undertake a major review of space technology and space planning and make the calculated decision that the only way to meet the Russian challenge was to meet it at the source of Russian prestige—in the space arena.”<sup>125</sup> Hardesty and Eisman also concur—the

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<sup>123</sup> Kay, *Defining NASA*, 72.

<sup>124</sup> Lambright, *Powering Apollo*, 94-5.

<sup>125</sup> Goldman, *Space Policy*, 86.

decision to go to the moon was a Cold War-based decision that “must be viewed through the prism of the rivalry between the two superpowers. The intense competition engendered a strongly felt American need to respond to Soviet space triumphs by showing that America was at least capable as the Soviets in this area.”<sup>126</sup>

T.A. Heppenheimer ascribes Kennedy’s decision to this Cold War competition and Kennedy’s sense of the march of history.

Waging total cold war, Kennedy believed that it was essential to deny Moscow propaganda victories as well as military ones. A prime topic for propaganda was spaceflight, and in no way would Kennedy concede that the Soviets might concentrate resources into this area while failing their citizens in a host of ways that were far more important. The issue was one of national prestige, what in earlier times had been known as national honor: if the world viewed space as important and saw that the Soviets were ahead, then America would have to meet this challenge and take the lead.<sup>127</sup>

Heppenheimer also suggests that Kennedy’s sense of his own legacy had much to do with the decision. “*Apollo* suited his sense of history, his view of the future, his spirit as a man. It was also very important in that it could deny Moscow

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<sup>126</sup> Hardesty and Eisman, *Epic Rivalry*, 123.

<sup>127</sup> Heppenheimer, *Space Shuttle Decision*, 152.

further victories and help to hold the line in the Third World.”<sup>128</sup> Kennedy had a keen sense of history, having written two books on the subject, and understood the effects that such an ambitious challenge would have on the nation and the world. Heppenheimer does not seem to think that the decision was rushed, short-term, or panicked. He believes that Kennedy fully understood that the moon program decision was a way to put all of America’s advantages to work against the Soviets, including technology and economic powers as well, where Kennedy understood America held an advantage. In an argument similar to Bob Gilruth’s, Heppenheimer lays out Kennedy’s reasoning:

[The moon program] represented a simple and dramatic goal that everyone could understand. It appeared reachable during that decade, and would not impose a prolonged effort that might lose public interest. In addition to this, the moon was demanding enough to call for an entirely new array of launch vehicles and spacecraft, requiring far more power than the Soviet rockets of the day could provide. The Soviet lead in rocketry would not help them; like the Americans, they would have to start afresh. Kennedy believed, correctly, that in the resulting competition the U.S. would prove more capable in coming up with the enormous sums of money that would be necessary to reach the moon.<sup>129</sup>

Eugene Emme agrees with Heppenheimer and attributes the decision to Kennedy’s personality and sense of history. “John F. Kennedy’s quick memory

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<sup>128</sup> Heppenheimer, *Countdown*, 188.

<sup>129</sup> Heppenheimer, *Space Shuttle Decision*, 154-5.

and his acute political instincts, his love of competition, debate, and winning, his intellectual and his managerial sense of history—these unsimple virtues were to be increasingly evident in the course of space history.”<sup>130</sup> The moon landing decision satisfied Kennedy’s predilection for all of these skills: it is a way to solve a political problem with a political solution; it sets up a direct competition with the Soviets that his predecessor avoided; he had to win the nation and Congress over with his oratory, a form of public debate; he expected that this was a way to win against the Soviets, who boasted of an advantage; and it certainly appealed to his sense of history in that it would take its place among great American triumphs over implacable foes, much like the Manhattan Project. Kennedy’s solution to his immediate problem satisfied all of his personal needs as well as resolving a national need for increased prestige. It also fulfilled his desire for risk-taking, since at the time it was the riskiest of endeavors from a national perspective and would at the time of the missions involve great personal risk and heroism for the astronauts involved.

Logsdon’s original assertion that Kennedy’s decision was an example of the “Rational Choice Model,” first asserted in his 1970 book, is reiterated unchanged in his 2011 update. The rational choice model assumes that after a desired outcome is identified, a decision-maker analyzes various options, deciding on the option that appears to offer the best cost-to-benefit ratio. The decision is thus made by being deliberate and pragmatic, although the desired outcome or solution to a problem does not necessarily need to be pragmatic. Logsdon

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<sup>130</sup> Emme in Durant, *Between Sputnik*, 50.

places the Apollo decision squarely in the context of the Cold War, considering it to be the last major political act of the Cold War. Once Kennedy decided that beating the Soviets in space was the solution to the national and his personal problems, the rational choice model for decision-making became active, and Kennedy began a deliberative process that ended with selecting a moon landing as the solution. The rational choice model makes sense in the context of meeting the objective, but was the objective itself, or Kennedy's reaction to the crisis rational? Logsdon argues that the nature of determining the objective is irrelevant to the rational choice model.

Logsdon argues that after the historian analyzes his decision-making process, President Kennedy "emerges as a pragmatic political leader who soon after entering office came to see the US civilian space program as an important tool to advance US foreign policy and national security goals. He was flexible in his approach to space activities, willing to compete if necessary but preferring to cooperate if possible."<sup>131</sup> Logsdon argues that Kennedy did not make a single, irrational, spot decision, but rather a series of decisions, each one after careful deliberation of facts and anticipated effects. Kennedy may have been willing to cooperate before the Bay of Pigs event and after he made the Apollo decision, but the idea that the US could cooperate with the USSR as a solution for the crisis was never considered. Logsdon considers Kennedy's emotions and examines the President's personality, but cites insufficient evidence for factoring them into his equation. "How much Kennedy's emotional state and competitive

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<sup>131</sup> Logsdon, *Race*, 4.

character determined or merely reinforced his resolve to proceed rapidly in space cannot be definitively known, but most evidence shows that they were influential but not decisive factors.”<sup>132</sup> Instead, Logsdon attributes Kennedy’s decision to a basic rationality, as he did with Eisenhower:

Eisenhower had come to a different judgment of the importance of space achievement (or rather its lack of importance) in terms of preserving US global leadership, which he saw as being based more on a sound defense, fiscal soundness, and social stability. John Kennedy, with his much more activist approach to government, had an opposing view. Kennedy was not at all a visionary in the sense of having a belief in the value of future space exploration; rather, his vision was that space capability would be an essential element of future national power, and thus that the United States should not by default allow the Soviet Union to have a monopoly of large-scale capabilities to operate in this ‘new ocean.’ I believe that this was a wise judgment, one from which the United States has benefitted over the past half century.<sup>133</sup>

Logsdon does take into consideration that Kennedy’s solution resolved his personal political problems at the same time that he resolved the nation’s issues, but prioritizes the nation’s problems over Kennedy’s problems in terms of the objective that the decision sought to address. “Certainly the immediate stimulus to the decision to go to the Moon was the threat to US global leadership posed

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<sup>132</sup> Logsdon, *Race*, 79.

<sup>133</sup> Logsdon, *Race*, 226.

by the world's reaction to Soviet space successes at the same time as the United States looked weak in its conduct in the Bay of Pigs fiasco. Kennedy's desire to regain his personal prestige and his administration's momentum were also problems addressed by the *Apollo* choice."<sup>134</sup> Logsdon argues that Kennedy's decision was not a personal one, but that of a great leader. That the decision solved Kennedy's personal political issues were coincidental. Logsdon sums up his case with the closing argument:

In summary then, I conclude that President Kennedy's commitment to a lunar landing program as the centerpiece of an effort to establish US space leadership was the result of thoughtful consideration, particularly given that it was reiterated a number of times between May 1961 and November 1963. The commitment was publicly embellished with rhetorical flourishes, but at its core was a Cold War-driven but rational policy choice."<sup>135</sup>

In a surprising conclusion to his book, Logsdon's evaluation of Apollo's effect on the US space program as being a negative one is brutally honest for someone who clearly loves Kennedy and the *Apollo* program. He agrees with Kennedy's decision, but believes that the prosecution of the program has ultimately hurt NASA. Logsdon feels that Apollo was the product of a particular moment in time, one not to be repeated; this moment in time, the moon landing, was the first globally-shared human experience.

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<sup>134</sup> Logsdon, *Race*, 231.

<sup>135</sup> Logsdon, *Race*, 233.

Roger Launius, the Head Curator of the National Air & Space Museum's Human Spaceflight collection and a prolific space historian, has authored countless books, collections, and articles on the US space program, and on *Apollo* in particular. His view on Kennedy's decision is that it was driven by events, a once-in-a-lifetime set of circumstances that allowed such an unlikely decision to be made. To Logsdon, it wasn't simply the Gagarin and Bay of Pigs incidents, but a larger set of historical forces, that influenced the decision. "A unique confluence of political necessity, personal commitment and activism, scientific and technological ability, economic prosperity, and public mood made possible the 1961 decision to carry out an aggressive lunar landing program."<sup>136</sup> The geopolitical effects of World War II were still being felt, and the two superpowers were slugging it out for world opinion and world supremacy. Modern communications methods such as radio, television, and newspapers guaranteed that the press' impression of events had become as influential as the events themselves had in years past. Kennedy needed to not only battle the Soviets in military, political, and economic arenas, but also in the world press which, in its influence as shaper of world opinion, became another front of the Cold War. And on many of these fronts, *Apollo* seemed like an ideal solution. "As *Apollo* was a remedial action ministering to a variety of political and emotional needs floating in the ether of world opinion. *Apollo* addressed these problems very well, and was

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<sup>136</sup> Launius, *History*, 66.

a worthwhile action if measured only in those terms.”<sup>137</sup> Launius seems here to suggest that only when taken in terms of geopolitical value could the *Apollo* decision be deemed a good one. Launius is not as positive regarding Kennedy’s decision as is Logsdon, and has some reservations. He cites the Bay of Pigs as the trigger for the decision, much as the assassination of Archduke Ferdinand by Gavrilo Princip was the trigger that started the First World War; other, larger factors had built over years, and the incident served to set things in motion—the same may be said regarding *Apollo*. “While the Bay of Pigs invasion was never mentioned explicitly as a reason for stepping up US efforts in space, the international situation certainly played a role as Kennedy scrambled to recover a measure of national dignity.”<sup>138</sup> Launius mentions, as do most of the other historians, that the President sought to restore national dignity, but I find it interesting that Launius uses the word “scramble” here—“scrambling” denotes an element of chaos and perhaps a touch of desperation. And what Launius does not mention is that Kennedy was also scrambling to restore a semblance of his own political dignity, which had suffered more than our national dignity.

Launius takes issue with Logsdon’s assertion that Kennedy’s decision followed the “Rational Choice Model” and that the decision was a logical one. Launius argues that Kennedy’s decision was politically pragmatic, but that it was not entirely rational in nature. Launius suggests that the decision was “muddled

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<sup>137</sup> Launius, *History*, 65

<sup>138</sup> Launius, *History*, 60

through” rather than decided upon rationally. Launius believes that Kennedy’s personality comes into play much more than does Logsdon:

Kennedy’s tortured background and aggressive tendencies may have affected his decision making process, causing him to take a more combative approach towards the Soviet Union than required and necessitating “winning” at whatever challenges came his way. At some level, Kennedy may have created some crisis situations wherein he reaffirmed his quintessential masculinity and enhanced his own dominance over everyone and everything. Most of these analyses depict Kennedy in an unfavorable light and focus on his tendencies towards competitiveness, recklessness and ambition.

President Kennedy’s assertive self-confidence may have provided an important element of the “Camelot mystique” but carried to a logical conclusion, it also led to tense Cold War situations in which on more than one occasion nuclear holocaust became a probable outcome. At the same time, that assertiveness hid a Kennedy weakness for indecisiveness and procrastination until pressed to take a stand. That, coupled with the lack of any essential ideology beyond a basic anticommunism and a faith in active government, ensured that there was more to the Apollo decision than rational action.<sup>139</sup>

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<sup>139</sup> Launius, “Kennedy’s Space Policy Reconsidered,” 19.

Launius takes the view that Kennedy's rationality and his emotions contributed to his decision to go to the moon. Kennedy's initial reaction was emotional, since his leadership was being questioned, but once he decided he needed a "big" solution, he methodically worked through the possible solutions with his trusted advisors, of which there were many.

I must agree more with Launius than I do Logsdon. Kennedy's personality traits are well-documented. To think that just three months after taking office that a confidence shattering series of events took place in full view of the world, that a man with Kennedy's temperament would react in a totally logical manner is, I think, a stretch. Having grown up after Kennedy's murder (I was born in 1962), I was not affected by his tragic death, but was surrounded by those who were. He was always a martyred President, much like Lincoln—tragic to say the least, but a historical figure for whom I had no emotional memories. All of the presidents since Kennedy were affected by their diverse personalities and predilections. I must assume that Kennedy's decision emanated from an emotional response to events as much as it did from his rational response to events and conditions, in the absence of convincing data to suggest otherwise.

This brings us to Michael Beschloss, who wrote an essay in 1997 that criticized Kennedy's moon landing decision as being emotional, irrational, and ill-considered. Beschloss agreed with Eisenhower that Kennedy's decision suggested panic and immaturity.

It is a measure of Kennedy's aversion to long-term planning and his tendency to be rattled by momentary crises that one may conclude that in the absence of a Gagarin triumph and the Bay of Pigs fiasco in April 1961, he might never have gone to the length of asking Congress to spend \$20 billion on a crash Moon program. Kennedy's desire for a quick, theatrical reversal of his new administration's flagging position, especially just before a summit with Krushchev, is a more potent explanation of his Apollo decision than any other. Johnson's desire for turf, McNamara's desire to use aerospace overcapacity, and Kennedy's own conviction that a Moon program was consistent with what Sorensen called 'the New Frontier spirit of discovery'—these things helped the decision along, but none was so important.<sup>140</sup>

Beschloss' damning rationale for Kennedy's decision assumes that the worst attributes of a person's personality override the nobler. While Beschloss believed that Kennedy's behavior during the Cuban Missile Crisis was exemplary, his view that Kennedy, while achieving his immediate political objectives, "did not necessarily think much about the long-term consequences."<sup>141</sup> Beschloss goes further with his assessment that the *Apollo* program was a wrong decision:

As Kennedy concluded, his decision for an accelerated Moon landing was ultimately a political decision made in terms of cold war strategy. How

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<sup>140</sup> Beschloss, in *Myth*, 63.

<sup>141</sup> Beschloss, in *Myth*, 63.

does it stand up now that the cold war is over? Not well. We now know that the reason the Soviet Union gave up in that struggle was that it recognized that it could not compete with the Western economies and Western societies in those areas of life and death that mattered. Although the Moon program contributed a great deal to the United States, the tens of billions of dollars spent in the 1960s on what Kennedy essentially thought of as world propaganda could probably have been better devoted to US defense or the American domestic economy, and that might have convinced the Soviets more quickly of the fruitlessness of the tragic conflict with the United States.<sup>142</sup>

There is no conclusive evidence either way as to why Kennedy made his decision to set America on the path to the moon, such as a diary entry or a memoir that Kennedy himself wrote. Historians and political scientists alike have argued that the decision was a rational one and others have argued that it was a reaction to a momentary crisis. The answer probably lies somewhere in between.

It is also interesting to consider whether Kennedy would have made the *Apollo* decision had the Bay of Pigs invasion not turned out so poorly. I tend to think that because space was not an issue on the forefront of Kennedy's mind when the incident occurred, the US space program would have progressed at a more natural rate. After the Gagarin mission, Kennedy began to consider a moon mission to establish American dominance in space, but the cost was considered

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<sup>142</sup> Beschloss, in *Myth*, 63.

too high—the very definition of the Rational Choice Model. It was not until the political fallout of the Bay of Pigs hit that the issue was raised to crisis level. It is here that the Rational Choice Model rationale breaks down. The choice would have the same outcome as it would have had just after Gagarin. However, the cost was now deemed to be acceptable in a cost-benefits analysis—the Rational Choice Model fails. Roger Launius sums up this alternate reality neatly:

Had the balance of power and prestige between the United States and the Soviet Union remained stable in the spring of 1961, it is quite possible that Kennedy would never have advanced his Moon program and the direction of American space efforts might have taken a radically different course. Kennedy seemed quite happy to allow NASA to execute Project Mercury at a deliberate pace, working toward the orbit of an astronaut sometime before the middle of the decade, and to build on the satellite programs that were yielding excellent results both in terms of scientific knowledge and practical application. Jerome Weisner reflected: 'If Kennedy could have opted out of a big space program without hurting the country in his judgment, he would have.'<sup>143</sup>

While some historians view Kennedy as weak and not totally in charge of events and foreign policy, and while others view Kennedy as strong, in charge, and an insightful leader, the full narrative that is laid out in Logsdon's book and in the accounts of the other historians and political scientists illustrate that Kennedy

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<sup>143</sup> Launius, *History*, 58.

was a “complex figure whose personality embraced elements of both images.”<sup>144</sup> Kennedy’s vision that space capabilities would be intricately entwined with national power is a view with which Logsdon agrees: “I believe that [the moon program] was a wise judgment, one from which the United States has benefitted over the past half century.”<sup>145</sup>

Kennedy’s decision was a complex one that provided America with perhaps its proudest moment—two humans walking on the surface of another planet. It also cost the nation dearly in treasure, and was scaled back after the mid-1960s due to conflicting priorities as judged by President Lyndon Johnson, who was prosecuting the war in Vietnam, a Kennedy legacy (although Johnson accelerated the effort), the *Apollo* program, another Kennedy legacy, and the Great Society initiative, Johnson’s legacy. The budgetary pressure from these three factors eventually caused Congress to slash NASA’s budget, and the war eventually destroyed Johnson politically.

However, despite the *Apollo 1* tragedy and delays, Neil Armstrong and Buzz Aldrin planted the American flag on the plains of the Sea of Tranquility on July 20, 1969, six months ahead of Kennedy’s deadline, and ahead of the Soviets, who had unsuccessfully prosecuted their own moon program. The *Apollo* program, and in particular, the first lunar landing of *Apollo 11*, has been hailed as the high point of the century.

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<sup>144</sup> Logsdon, *Race*, 225.

<sup>145</sup> Logsdon, *Race*, 226.

Several days after the historic landing of Eagle, as the world was still celebrating that humanity was now a multi-planet species, the engineers in the mission control room were reminded why they were all there. When the *Columbia* splashed down, the center view screen in Houston's Mission Control room, which had up to now displayed trajectory data, went black. When it relit, it displayed:

***I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth.***

***--John F. Kennedy to Congress, May 1961***

Then the right-hand screen, which had been showing the mission patch, displayed:

***Task Accomplished. July 1969.***

Kennedy's decision, made over the course of several weeks, drove 400,000 Americans for eight years, at unprecedented cost, through tragedy and triumph, culminating in an event inconceivable just 20 years earlier. Although he never lived to see the results of his challenge, John Kennedy and the Apollo program will likely be the one event from the 20<sup>th</sup> century remembered centuries years from now.

## CHAPTER III

### RICHARD M. NIXON AND THE SHUTTLE DECISION

#### Apollo in an Era of Change

In the late 1960s, NASA had brought triumph to the United States by fulfilling John Kennedy's challenge to get to the moon and back by the end of the decade. The task had taken tens of billions of dollars, the tireless efforts of over 400,000 people, and eight years to accomplish. During that time, getting to the moon within Kennedy's mandated timeframe and before the Soviets was NASA's monomaniacal quest. As discussed in Chapter Two, the spirit of the martyred President animated and drove NASA's activities during this period. Both President Lyndon Johnson and NASA Administrator James Webb appealed to Kennedy's legacy when waning public and Congressional interest resulted in decreasing budgets after 1966, deftly avoiding program cancellation, even after the *Apollo 1* accident and inquiry. As the Golden Era neared its peak with the planned series of ten lunar landings, NASA began to plan for their next ten years, which they saw as even more grand and dramatic than the preceding ten. NASA envisioned a space station, a space shuttle to get there, a permanent moon base, a space tug, a trip to Mars, and other spectacular and ambitious projects.

Until now, NASA had operated with an unprecedented budget (although it had been scaled back from 4% of the federal budget) and maximum political clout in the person of James Webb, a veteran politician who knew just how to work Congress in NASA's favor. But while Webb was a political master, he had steered NASA through a largely favorable political climate. *Apollo* had been spearheaded by Kennedy, had been approved almost unanimously by Congress, and had enjoyed the good will of the nation. After Kennedy's death, it became something of a sacred tribute to Kennedy's memory, and although President Johnson had become entangled with the Vietnam war and the escalating costs of his Great Society social initiatives, *Apollo* was in no real danger of being cancelled before it could fulfill its destiny by landing on the moon.

The events that would soon take place would change the nation and NASA forever. The Cold War was largely on hiatus, and although the Soviets continued to engage the US in proxy wars and in space, the threat of nuclear annihilation had largely abated after the Cuban Missile Crisis. The national culture shifted over the decade from a Cold War mentality to a more liberal, socially-conscious culture that enabled the Civil Rights movement, the anti-war movement, the environmental movement, feminist movement, growing counterculture and social permissiveness, and a general lack of trust in the government, which spread throughout the nation. Assassinations, race riots, domestic terrorism, and a general unrest shifted the national mood from one that was tense because of the perceived Soviet threat to one of internal tension caused by shifting priorities and changing mores.

NASA was oblivious to much of this shift because their employees were working long hours to meet Kennedy's deadline, and they missed the changes that were occurring on the street and on television. One need only compare the colorful clothes and long hair worn by people on the street at that time to the white shirts, crew cuts, and pocket protectors evident in the NASA control rooms to see that the culture had shifted without NASA. As an organization, NASA seemed frozen in the early 1960s, and the management's thought process was seemingly stuck in that mode as well. NASA was born of Cold War competition and grew to an enormous size in that environment. Having missed the cultural revolution, they planned for a future under the old assumptions—that NASA was fighting a quasi-military battle on the frontlines of the Cold War. This was no longer the case, but NASA had not changed its internal mindset to reflect the changes. Perhaps it was bureaucratic inertia or the hubris that comes with competing head-to-head with a mortal enemy in full view of the world and winning, but NASA was suddenly out of phase with the rest of the nation and its priorities. NASA administration believed that their triumph and their elevated place in the theater of geopolitics would guarantee continued growth, but the soil that had nourished it for so many years would no longer support its inflated budget.

Astronaut William Anders' iconic photograph of the "Earthrise" taken during the *Apollo 8* mission in late December 1968 elicited a visceral reaction for the astronauts who witnessed the event firsthand and for all who viewed the photograph. It pictured the Earth with no political boundaries, floating solitary in the blackness of space with a wispy-thin atmosphere, appearing very vulnerable

and alone in the cosmos. The image prompted epiphanies in many minds, revealing that the Earth was fragile and that humans needed to become better stewards of it. This image, with the associated concept, was immediately appropriated by the budding environmental movement, and it quickly became a popular poster that hung in many American bedrooms. The “Earthrise” revelation was indicative of a more general “awakening” in the public that while traveling into space was admirable, it was our duty to solve problems back on the planet first and foremost.

President Johnson, worn down by prosecuting the War in Vietnam and the War on Poverty, decided not to run for reelection. Richard Nixon won the presidency in 1968, and assumed office over a very different America than in 1960. Nixon also inherited a flourishing *Apollo* program, one that was ready to land on the moon and fulfill Kennedy’s challenge. It is arguable whether Nixon would have chosen the same path as Kennedy in going to the moon; the evidence strongly suggests that Nixon would have continued Eisenhower’s organic space program, which operated at a natural pace and certainly did not attempt to race against the Soviets. Original NASA Administrator T. Keith Glennan would likely have stayed on had Nixon beaten Kennedy in 1960, and he probably would not have pushed for Apollo to the degree that Webb did under Kennedy. What Nixon did with this thriving program is the opposite of what Kennedy did: Nixon sought to scale the US space program back drastically. Nixon was more fiscally conservative and wanted to dramatically reduce government spending on the War, on the Great

Society initiatives, and in space; he felt that the federal budget was bloated, as did Eisenhower, and sought to slash it.

Nixon's governing style was very different from Kennedy's. While Kennedy was gregarious and sought input from many quarters (including threatening to ask the White House janitors for an answer to how the US could beat the Soviets in space), Nixon sought to isolate himself from others, trusting only a few long-time friends and aides, from whom he took counsel. Nixon held very few meetings with people outside these few aides, preferring to rely on his trusted inner circle. Unfortunately for NASA, there were few in this group who advocated for the aggressive space policy that NASA envisioned. Nixon also differed from Kennedy on foreign policy. Where Kennedy often found himself aggressively challenging the Soviets head-to-head, Nixon adopted a more statesmanlike approach, preferring diplomacy and negotiation to conflict. Since NASA was structured at that time to compete directly with the Soviets, Nixon sought to change it. And finally, the political will that enabled Kennedy to appeal to Congress and the nation and win their approval for an aggressive space program had vanished. The Congress was currently more concerned with the domestic problems of the United States. The war against communism in Vietnam had bogged down and was draining the national treasury; many in Congress thought that money would be better spent at home rather than either halfway around the globe or on the moon. "The conditions that made Apollo possible in the 1960s

were not present in the new decade. For NASA, the policy problem was not how to go to Mars but how to keep the space program alive.”<sup>146</sup>

NASA, once enjoying favored status within the nation and the government, now had to take its place beside the nation’s other more pressing priorities. For the first time in its history, NASA had to become political, had to justify its existence and even had to fight for its survival. After Nixon failed to approve NASA’s lofty plans for the future, it was forced to fight for anything, something for which it was not culturally equipped. The national space agency was forced to transform itself from an idealistic institution fighting for the American way to a political animal fighting for whatever it could get.

The shuttle decision gave NASA its political baptism. Unable to get their overall vision approved, NASA scientists and engineers plunged into the morass of incremental politics. They had to negotiate shuttle design details with the White House staff. They felt obliged to accept a technologically inferior program in order to win political support, and they had to engage in the game of bureaucratic politics, seeking outside support from groups like the military, who came to NASA’s aid.<sup>147</sup>

NASA no longer had an advocate in the White House and found itself in very different and new territory. The agency tried to continue on in the same mode as it had in most of the 1960s, but this approach was soundly rejected by the new

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<sup>146</sup> Lambright and VanNijnatten in *Space Policy in 21<sup>st</sup> Century*, 174.

<sup>147</sup> McCurdy, *Space Station Decision*, 32.

administration, in preference for a minimalist approach to space. Lambright and Van Nijnatten captured the mood of the era accurately when they made the following assessment:

The heroic years of NASA were followed in the 1970s by less-spectacular actions in a very different decade. NASA may have wanted to go to Mars, but political leaders and the general public had other priorities. When von Braun died in 1977, his original step-by-step paradigm continued, but NASA was back at an earlier point in the trajectory than it had been in 1969.<sup>148</sup>

President Nixon denied NASA's plans for a suite of grand projects, instead asking them to select one project from the list as a consolation. "Faced with a choice between the Space Transportation System and a space station, NASA officials selected the former. They also decided to pursue the remaining elements in their unapproved long-range plan incrementally, one by one, waiting to advance the space station until the shuttle became operational."<sup>149</sup> Nixon approved the space shuttle plans, but the incredible technical infrastructure created for the Apollo program was left to wither and die. How did this happen? Why was NASA denied the support it thought it had earned at the very moment of its greatest triumph? Why did a man who was an advocate of the space program slash NASA nearly to the bone and leave it with a vehicle in search of a mission?

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<sup>148</sup> Lambright and Van Nijnatten in *Space Policy in 21<sup>st</sup> Century*, 175.

<sup>149</sup> McCurdy, *Space Station Decision*, 227.

## Early Nixon Presidency

Richard Nixon, who we have seen was an advocate of space exploration when a presidential candidate in 1960, was again nominated by the Republican Party to run for president in 1968 against Senator Hubert Humphrey. Nixon campaigned on the argument that the US should never be second in space, but, like Kennedy, he did not back up his words with actions once he won the presidency. The same phenomenon took place under Johnson, before Nixon—Johnson was a space advocate until he became President, at which point, he oversaw a steady decline in NASA's budget, just as Nixon did. And like Kennedy, Nixon would probably not have addressed space at all, but circumstances forced the issue.

Rather than world events' forcing a decision on Nixon, it was Johnson who did so, leaving the formulation of space policy for his successor. James Webb, NASA Administrator under both Johnson and Kennedy, tried unsuccessfully to get Johnson to dictate NASA's future the way Kennedy had done. Webb wanted the full support of the President, whose leadership would drive political consensus. Johnson would not comply, and the effect was to make no decision at all on the strategic direction of NASA. The decision and direction were left for Nixon to determine. Joan Hoff comments that "this is unsurprising, because Johnson also deliberately postponed implementing desegregation of southern schools so that this controversial task would likewise fall on the Nixon watch. Had it not been for Johnson's procrastination, Nixon would not have immediately

turned his attention to space policy.”<sup>150</sup> In February 1969, Nixon commissioned a Space Task Group (STG), which was charged with making recommendations on the future direction of NASA. However, Nixon had in his mind that he wanted to reduce NASA for fiscal and political, but also very personal reasons.

Well before the moon landing, Richard Nixon was calculating how he could minimize the space program’s further influence on popular and political culture, since he believed—rightly, as it turned out—that the glory of the moon program would be forever associated with his predecessors Kennedy and Johnson, whom he loathed.<sup>151</sup>

Nixon considered shutting NASA down entirely, but he did not want to be the President who ended human spaceflight, which was very popular after the *Apollo 11* success. However, with each successive moon shot, the American people became less and less interested, television coverage withered after *Apollo 11*. Nixon greatly enjoyed being the President when humans first landed on the moon, which he displayed by grandstanding. For example, several minutes after the astronauts left the LM to walk on the surface of the moon for the first time in history, Nixon called Armstrong and Aldrin on the lunar surface in perhaps the greatest presidential photo opportunity ever. It was, in typical Nixon style, awkward, but Armstrong, as always, was gracious and found elegant words in the strangest of situations. It was Nixon’s name, not Kennedy’s, that was etched on the plaques on the LM legs that were left on the lunar surface, and it was

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<sup>150</sup> Hoff, in *Myth*, 97.

<sup>151</sup> Klerkx, *Lost in Space*, 169.

Nixon who greeted the *Apollo 11* astronauts on the deck of the *USS Hornet* on their arrival back on Earth. The political benefits for Nixon bestowed by NASA and the crew of *Apollo 11* and of subsequent moon landings were incalculable, but Nixon persisted in believing that the landings would be Kennedy's legacy, which he could not tolerate. Accordingly, Nixon cancelled the scheduled *Apollo*s 18, 19, and 20, even though the money had already been spent in building the *Saturn V* launch vehicles and *Apollo* CSM and LMs for the three missions. Nixon, while frugal, was even more petty. As we will see, Nixon took the findings of the STG, which advocated NASA's vision of a grand plan designed to garner unparalleled scientific knowledge and national prestige, and put it in his desk drawer, where it sat for six months before he enunciated his own vision of US space policy.

### Changing Culture and Language

To be fair to him, Nixon took office in a vastly different America than the one he would have presided over had he won in 1960. 1969 was shaping up to be the most turbulent period in US history since the Civil War. Civil unrest, assassinations of public figures, and a general feeling that the anger and dissatisfaction felt by much of the nation were about to boil over gripped the country.

When Kennedy took office, he promised a New Frontier, seizing upon a uniquely American trope—Frederick Jackson Turner’s frontier metaphor. Turner, a 19<sup>th</sup> century historian, delivered a seminal paper, “The Significance of the Frontier in American History,” to the American Historical Association in 1893, which argued that the spirit and success of the United States were directly tied to the country’s westward expansion in the 19<sup>th</sup> century, that the forging of the unique American identity occurred in the crucible between the civilization of settlement and the savagery of wilderness, and that taming the wild had developed American strength, individuality, and exceptionalism. The idea of American Exceptionalism, which still persists, was first suggested in Turner’s paper, which swept the nation’s intelligentsia and became a dominant concept. Because of the frontier experience, Americans were no longer Europeans, but had become “rugged individualists,” and this unique national experience engendered the characteristics of the American persona: egalitarian, democratic, aggressive, and innovative. Jackson’s thesis argued that every positive quality that Americans possess had its genesis in the frontier experience, and that the frontier calls on the adventurous spirit of the American people and offers the promise of change in society.

This idea was a natural fit for Kennedy, who campaigned for public office on the image of his youthful strength and the themes of dynamism and change, all of which set him in stark contrast to Kennedy’s depiction of Nixon as an agent of the Eisenhower administration’s stasis, entropy, and inaction. During Kennedy’s speech at Rice University in September of 1962, he promoted the *Apollo* project

through appeals to the theme of frontier exploration leading to societal change: “We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all.”<sup>152</sup>

To Kennedy, at least rhetorically, space was a place to be conquered in the same way that the mythical frontier of the American West was conquered, and the benefits would be shared by all. Kennedy’s addresses were rife with frontier metaphors and the notion that we were involved in a space “race” with the Soviets. The idea of a “race” evoked the image of the settlement of the US west in the 19<sup>th</sup> century: a race to expand to the West Coast, Manifest Destiny, and the race by settlers to stake out their own territory in the wilderness before it was settled by more eager homesteaders. Humanity was destined to expand into the cosmos just as the American settlers were destined to conquer the savage continent. In a speech celebrating John Glenn’s orbital flight in 1962, Kennedy employed this motif: “We have a long way to go in the space race. We started late. But this is the new ocean, and I believe the United States must sail on it and be in a position second to none.”<sup>153</sup> Kennedy’s language had an outward thrust, just as space exploration was leading humanity outward into the unknown—in Kennedy’s view, humanity was moving out into space, expanding the frontier into space, racing into space. And Kennedy was highly effective in inextricably

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<sup>152</sup> Kennedy, "Address at Rice University in Houston on the Nation's Space Effort," September 12, 1962.

<sup>153</sup> Kennedy, "Remarks Following the Orbital Flight of Col. John H. Glenn, Jr.," February 20, 1962.

harnessing his (and the nation's) current political situation to the historical aspirations and ethos of the American people.

The race metaphor was key to this rhetorical edifice. As discussed in Chapter Two, Kennedy was a competitive individual, as was American society.

Competition drove the American economic system, the American obsession with sports, and the competition with the Soviets for world domination was intense.

Competition with the Soviets in space, especially in the context of the Cold War, kept the Americans enthusiastic about the space program, although this enthusiasm would wane with the decline in tensions that accompanied the cooling off of the Cold War. The space race metaphor, while invaluable in the short term to maintain Congress' and the public's interest and support, ultimately doomed NASA' prospects for continued interest and funding. This is because all races eventually come to an end.

When the US beat the Soviets to the moon with the *Apollo 11* landing, the entire *raison d'être* for the space program was invalidated. President Kennedy challenged the entire nation to beat the Soviets to the moon, and the country dutifully pitched in, sacrificed, won the race, and enjoyed the outpouring of love and respect that the feat brought about from the world community. Now the race was over; the US had won—what was next? Jonathan Allday describes the situation: “The problem NASA faced was the perception that Apollo had been staged primarily as a race against the Soviets. The scientific benefits of the program were dubious and had not been emphasized. The race had been won. In order to justify the continual staging of flights, the science now had to be

stressed.”<sup>154</sup> In the late 1960s, the end of the race was the issue that NASA struggled with—justifying their continued existence and, more importantly, their large budget in a period of changing priorities and economic hardship.

A Gallup poll conducted in the early 1970s just after the final *Apollo* landing indicated that 59% of the American polls favored spending less in space, while only 7% favored spending more. What is strange about this result was that the same poll showed that public confidence in the space program was high—people still loved the space program, but no longer wanted to pay for it.<sup>155</sup> Congress had the same opinion: they liked the results of the space program, but balked at the high cost. This contradiction would set the stage for a shift in the rationale for NASA’s justification for its programs from one of national prestige to one of cost-efficiency as the driving factor. As we will see, this new emphasis on cost drove the process by which NASA wound up with the space shuttle.

The “Earthrise” photographs from *Apollo 8* and similar images from subsequent *Apollo* missions affected anyone who witnessed it in person or who saw the images in a very basic and emotional way. The “Earthrise” image changed the way that people viewed their home, the planet Earth. A day after the photograph was published, poet Archibald MacLeish published a short essay on the effects of seeing the image, titled “Riders on Earth Together, Brothers in Eternal Cold,” which ended with a line summing up the experience: “To see the earth as it truly is, small and blue and beautiful in that eternal silence where it floats, is to see

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<sup>154</sup> Allday, *Apollo in Perspective*, 250.

<sup>155</sup> McCurdy, *Imagination*, 118.

ourselves as riders on the earth together, brothers on that bright loveliness in the eternal cold—brothers who know now they are truly brothers.” On *Apollo 8* and subsequent moon shots, astronauts who were religious talked of having religious experiences when witnessing this sight; those who were not religious had spiritual reactions or were profoundly affected in other ways. This realization occurred at the same time that America was waking up spiritually to the environmental movement, which was called the ecology movement at the time. The first Earth Day was declared in April of 1972, and President Nixon founded the Environmental Protection Agency to look after the biosphere, which was now seen not only as fragile and vulnerable, but under siege from the forces of human progress. This was part of the larger “awakening” of the younger generation, who had an innate distrust of government, was virulently anti-war, and harshly judged the values on which their generation had been raised.

Where earlier generations of Americans had looked outward to progress and an expansive future, the new generation coming of age in the late 1960s began to look inward, to look back at Earth, to question ideas that five years earlier had been taken for granted. A social sensitivity replaced the Cold War mindset. While some members of Congress began to question the rationale and great expense of the Apollo program during the early 1960s, that point of view gained widespread acceptance toward the end of the decade, just as *Apollo* began to realize its objectives.

Although some Republican members of Congress had, in the first few days after the Gagarin flight, attacked the President for not investing enough in the space program, by 1963 GOP representatives and senators had taken to criticizing him for spending too much. In May, for example, the Senate Republican Policy Committee released a report urging that *Apollo* be scaled back and that the money be redirected to—using a phrase that would be heard more and more frequently in the years ahead—“problems here on earth.”<sup>156</sup>

This sentiment grew over the course of the decade until NASA found itself moving against the flow of popular opinion. Nixon’s first NASA Administrator, Thomas Paine, either did not realize this disparity or refused to acknowledge that times had changed, and continued to fight for NASA’s budget using the old Kennedy-era rationale, which no longer was effective. In fact, this approach served to alienate the Nixon administration rather than to sway it. There is evidence that some in NASA had seen the cultural shift and recognized that the rules had changed. George Low became NASA Deputy Administrator in December 1969 and saw firsthand the cultural changes and the stress that they placed on NASA administration. He was a key player in the fight for the space shuttle, and his personal notes, preserved within the NASA History Office archives, give us an inside view into this turbulent period in NASA history. Low’s

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<sup>156</sup> Kay, *Defining NASA*, 79.

observation on the difference between the NASA of the 1960s and the NASA of the 1970s is startling in its prescience, coming as it did in 1970:

In the 1960's, the country was definitely looking outward, and national priorities included the Apollo goal, because this would establish clearly in our minds and in the minds of the world technological leadership by the United States. Therefore, the single-purpose goal was to beat the Russians to the moon. Everything else in space flight was tacked onto this goal. The situation in the beginning of the 1970's is very different. We are now an introspective nation. We will do only those things that help ourselves and help ourselves at an early date. We're looking inward rather than outward. This is why anything we say about the environment or the quality of life or ecology has a great deal of appeal, as does health, education, and welfare, while both national defense and space have very little appeal. Space, in particular, has received very negative opinions on every poll that has recently been conducted and, of course, the very close vote in the Senate also bears this out.<sup>157</sup>

Not only did Low perceive the shift, but he also foresaw the role that NASA would take in the future. It was no longer sufficient to explore space and achieve wondrous objectives, or, for that matter, to win a victory for the nation in a quasi-military competition.

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<sup>157</sup> George Low, Personal Notes No. 27, July 18, 1970, NASA Historical Office archives, pages 13-14.

It is clear, therefore, that if we are to move forward with a strong space program, it, too, must be useful to the people here on earth. This means that a space applications program and, specifically, an earth resources program should be the keystone for the space effort of the 1970's. It is also clear that a strong United States must continue manned flights and, therefore, there must be some association between the manned spaceflight program and the earth resources programs.<sup>158</sup>

President Nixon certainly recognized this cultural shift, since he was one of the foci at the center of the storm. Nixon's 1969 inaugural address reflected this cultural shift and also manifested his preference for diplomatic cooperation rather than direct competition.

Those who would be our adversaries, we invite to a peaceful competition-- not in conquering territory or extending dominion, but in enriching the life of man.

As we explore the reaches of space, let us go to the new worlds together-- not as new worlds to be conquered, but as a new adventure to be shared.

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<sup>158</sup> George Low, Personal Notes No. 27, July 18, 1970, NASA Historical Office archives, page 14.

With those who are willing to join, let us cooperate to reduce the burden of arms, to strengthen the structure of peace, to lift up the poor and the hungry.<sup>159</sup>

Nixon's rhetoric in his first Inaugural Address thrusts out into space, only to turn and look back at the Earth, where space should be used not to compete, but to solve the problems of the people of the planet. (Interestingly, this rhetorical U-turn co-opts the promises of communism to create a global community in which want and greed are both conquered as all receive just enough to be satisfied.) In finishing his Inaugural address, Nixon discusses the effects of and the lessons learned from the *Apollo 8* mission:

Only a few short weeks ago we shared the glory of man's first sight of the world as God sees it, as a single sphere reflecting light in the darkness.

As the *Apollo* astronauts flew over the moon's gray surface on Christmas Eve, they spoke to us of the beauty of earth—and in that voice so clear across the lunar distance, we heard them invoke God's blessing on its goodness.

. . .

In that moment of surpassing technological triumph, *men turned their thoughts toward home and humanity*—seeing in that far perspective that man's destiny on earth is not divisible; telling us that however far we *reach*

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<sup>159</sup> Nixon, "Inaugural Address," January 20, 1969.

*into the cosmos*, our destiny lies not in the stars but on earth itself, in our own hands, in our own hearts.<sup>160</sup>

After he describes the *Apollo 8* astronauts' transcendental experience in spiritual terms, we understand that Nixon, too, has been touched by the Earthrise experience (or at least his speechwriters were). Nixon again evokes the "outward-inward" motif here in stating that by reaching for the stars, we have been able to see Earth (and its problems) with clarity. And by implication, these problems are those that should occupy our attention.

While the *Apollo 11* astronauts were still on the moon, Nixon spoke to students about the meaning of the moon landing, using the same U-turn motif:

I realize the kind of teamwork, the kind of scientific achievement, the kind of idealism that we saw in that space shot, that landing on the moon. If we could just bring all that to bear on the problems here on earth, the problems of our environment, the problems of adequate food, health, and shelter, and progress, a fair share for everybody in this earth—if that can be done, what a world we can create.<sup>161</sup>

On the return of the *Apollo 11* astronauts to Earth several days later, standing on the deck of the USS *Hornet*, Nixon evokes the same motif: "this is the greatest week in the history of the world since the Creation, because as a result of what happened this week, the world is bigger, infinitely . . . , [yet] as a result of what

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<sup>160</sup> Nixon: "Inaugural Address," January 20, 1969.

<sup>161</sup> Nixon, "Remarks to American Field Service Students," July 22, 1969.

you have done, the world has never been closer together.”<sup>162</sup> Several weeks later, during Nixon’s post-*Apollo 11* world tour, he remarked in Bucharest, “I believe that if human beings can reach the moon, human beings can reach an understanding with each other.”<sup>163</sup> Nixon’s other usages of this trope when discussing the space program in his public remarks are too numerous to list here and the analysis of them could fill a book. Suffice it to say, the President was not only aware of the cultural shift and its relationship to the US space program, but he had also internalized the underlying concept and had begun to think of the US space program in those terms. Linda Krug summarizes this new understanding of the relationship between the space program and the American people:

It takes us from the realization that the discovery of the moon cannot occur without a simultaneous discovery of the earth, it brings us face to face with the understanding that our quest for understanding is a mainstay of American character, and it forces us to accept that we have moved beyond the pioneering stage and must now work on improving our efforts.<sup>164</sup>

After ignoring the STG report, Nixon finally released a statement on space policy on March 7, 1970. Here, Nixon continues usage of the “outward-inward”

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<sup>162</sup> Nixon, "Remarks to Apollo 11 Astronauts Aboard the U.S.S. Hornet Following Completion of Their Lunar Mission," July 24, 1969.

<sup>163</sup> Nixon, "Remarks on Arrival at Bucharest, Romania," August 2, 1969.

<sup>164</sup> Krug, *Presidential Perspectives*, 55.

metaphor of having to go into space to be able to truly see the Earth. This time, however, he uses it to define US space policy:

Over the last decade, the principal goal of our nation's space program has been the moon. By the end of that decade men from our planet had traveled to the moon on four occasions and twice they had walked on its surface. *With these unforgettable experiences, we have gained a new perspective of ourselves and our world.*

*I believe these accomplishments should help us gain a new perspective of our space program as well.* Having completed that long stride into the future which has been our objective for the past decade, we must now define new goals which make sense for the Seventies. We must build on the successes of the past, always *reaching out* for new achievements. But we must also recognize that many critical problems *here on this planet* make high priority demands on our attention and our resources. By no means should we allow our space program to stagnate. But—with the entire future and the entire universe before us—we should not try to do everything at once. Our approach to space must continue to be bold—but it must also be balanced.<sup>165</sup>

Nixon's new argument is that in going forward, the space program should continue to be "bold," but "balanced." That is, the US space program needed to aspire to great achievements, but it also needed to take its place alongside other

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<sup>165</sup> Nixon, "Statement About the Future of the United States Space Program," March 7, 1970.

national priorities, like pressing social and economic issues—space projects needed to “take their place within a rigorous system of national priorities,” among which are “many critical problems here on this planet make high priority demands on our attention and our resources.”

In this policy statement, Nixon lays out the three goals that the US program must accomplish moving forward under his administration. The first purpose was exploration; the second purpose was the attainment of scientific knowledge (“a greater systematic understanding about ourselves and our universe”); and the third was a practical application, of “turning the lessons we learn in space to the early benefit of life on earth.” He goes on to say that “these lessons will not apply themselves; we must make a concerted effort to see that the results of our space research are used to the maximum advantage of the human community.”<sup>166</sup>

In the same policy statement, Nixon goes on to discuss the specific objectives of US space policy in his administration. He lays out six goals that NASA should accomplish. The first is that the US “should continue to explore the moon,” which we did for the next two years; however, Nixon’s elimination of the final three planned *Apollo* lunar landings put a premature end to lunar exploration, and we have not returned since. The second goal is that NASA “should move ahead with bold exploration of the planets and the universe,” which it did with the *Voyager*, *Viking*, *Mariner*, *Explorer*, and *Pioneer* probes of the 1970s. Nixon here

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<sup>166</sup> Nixon, “Statement About the Future of the United States Space Program,” March 7, 1970.

alludes to a human mission to Mars, which he later refused to approve. The third goal drove the decision-making process that resulted in the space shuttle, when Nixon decided that NASA “should work to reduce substantially the cost of space operations.” That the third goal was related to the shuttle program becomes explicit when Nixon mentions studies underway for a reusable shuttle. The impulse to reduce costs as a driving force in space policy had adverse implications, which will be discussed at length later. The fourth goal was that the US space program “should seek to extend man's capability to live and work in space,” which was undertaken under the auspices of the *Apollo Applications Program* with the launch of *Skylab* and the three crewed missions to it using equipment from the cancelled moon missions. The fifth goal is that NASA “should hasten and expand the practical applications of space technology,” returning to Nixon’s trope of “outward-inward” and public utility. He argues that the “very act of reaching into space can help man improve the quality of life on earth.” The sixth and final objective is that NASA “should encourage greater international cooperation in space,” a very Nixonian desire to use space as a tool of foreign policy, which was done during the *Apollo-Soyuz Test Project (ASTP)* of 1975, and through the various global goodwill tours taken by both Nixon and the astronauts themselves.<sup>167</sup>

The US now had a new space policy, one that was markedly different from that of John Kennedy and distinctly Nixonian. Both policies were products of their time

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<sup>167</sup> Nixon, "Statement About the Future of the United States Space Program," March 7, 1970.

and reflected the distinct characteristics of the respective presidents. And despite the very different global political climate when they were formulated, both policies were actually born of the Cold War; Kennedy's came during the most acrimonious period of the Cold War, and assumed his personal characteristics of competition, aggression, and confrontation, while Nixon's space policy was forged during a "cooler" period of the Cold War, and reflected his preference for frugality, diplomacy, and international cooperation. Each also reflected the tenor of the times: Kennedy's came during a period of world polarization and out of a US need for "battle" with their mortal foe, the Soviet Union; in contrast, Nixon's policy was formulated during a period in which domestic issues largely trumped international ones—the US, weary of a long war in Vietnam, sought to take care of the ailing social and political infrastructure at home.

Another entry from George Low's personal notes perfectly illustrates the difference between the times and the strategies that NASA had to adopt in each in order to thrive. In an addendum to his personal notes from 1970, Low writes:

### FY '72 Strategy

#### 1. Strategy of the '60s

- a) The American way of life is the best
- b) It is of the highest national priority to demonstrate this—and to help preserve our way of life where it is endangered.
- c) We will do this with force if necessary.
- d) Since the Soviets have selected space as an arena to demonstrate their state of technology, we must compete in that arena—we must clearly demonstrate our preeminence there.
- e) (should have been 'a') Given—the Soviet Union offers a real threat to us and our way of life

2. Question—Can we measure results? Did our beating the Russians to the moon have the desired effect?

3. Situation in 1970

- a) There are domestic problems (and an awareness thereof) that did not exist in 1960.
  - i. Opposition to war
  - ii. Campus unrest
  - iii. Integration
  - iv. Environment and quality of life
- b) Soviets [are] no longer a threat
- c) We have demonstrated superiority in space

4. Strategy for '70s

Alternative 1-

- Assume continued international competition (demonstration) is required to keep US viable and young
- Military intervention (i.e., SE Asia) is fruitless
- Let us firmly establish space as an arena for international demonstrations—i.e., let us stay first and best

Alternative 2-

- The country wants to look “inward”—no interest in “being first,” “preeminence,” etc.
- Space can contribute to that inward look
- Let us establish a program that derives the maximum from space to solve our domestic problems<sup>168</sup>

Once again, Low’s perceptive eye has captured the spirit of both ages and has preserved them for posterity.

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<sup>168</sup> George Low, Handwritten Addendum to Personal Notes No. 30, September 6, 1970, NASA Historical Office archives.

## The Space Task Group Report

In early 1969, the new President called for a Space Task Group (STG) to reduce NASA costs, to determine options for the post-Apollo period, and to look for ways to increase international cooperation. The team, chaired by Vice President Spiro Agnew, was to study the situation for six months and report back to Nixon. The STG planned to issue its report in September, ostensibly in time to influence the 1971 Fiscal Year budget process; however, the budget process was being conducted in parallel to the STG study. The newly appointed NASA Administrator, Tom Paine, saw this timing as an opportunity to lobby Agnew, and by extension, Nixon, on a very expensive crewed Mars mission. In doing so, Paine overestimated both Agnew's and NASA's clout with Nixon, but he stubbornly refused to see that the environment for post-*Apollo* projects had changed drastically. Bureau of the Budget (BoB) director Robert Mayo had repeatedly stressed the new budgetary reality, but Paine brushed off his advice. Paine refused to follow BoB reporting procedures and demands, believing that NASA was so popular that it was entitled to continue to receive its historically large outlays. Joan Hoff reports that Paine's arrogance was both evident and unprecedented: "He ignored BoB's requests for budget analysis not once, but twice in the spring and fall of 1969. That Paine's efforts were poor in this regard was evident from the moment that he tried to comply with the STG for its long-range plans."<sup>169</sup>

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<sup>169</sup> Hoff, in *Myth*, 103.

While the STG was undertaking their study, Paine bypassed them and approached Nixon directly, urging him to publicly release a space policy that included a Mars mission before the Soviets announced their space station initiative (or before the STG study had been completed). Nixon did not like Paine's imperious demeanor, nor did he care to deal directly with people outside his inner circle of advisors. Nixon's inner circle advised him not to respond to Paine's attempt to subvert the process, so Paine decided to take a different tack. He began attempts to influence the STG group's findings, alienating both the BoB officials and Nixon's aides, the very two groups Paine would need to have on his side in order to get his way with the President. Peter Flanigan, Nixon's assistant for internal economic affairs, under whose purview the space program fell, personally telephoned Paine and "instructed him to stop public advocacy of early manned Mars activity because it was causing trouble in Congress and restricting Presidential options."<sup>170</sup>

It was becoming clear that Nixon was not in favor of expanding NASA programs, but rather desired to reduce them. After Nixon made it clear that the new federal budget would be smaller, special assistant to the president Clay Whitehead, who had been asked by Flanigan to monitor the NASA budgetary process, reported back to Flanigan as follows:

As you know, I have expressed in the past some uneasiness about the review of the future of our space program. My main concern is that NASA and others will use the enthusiasm generated by a success of Apollo 11 to

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<sup>170</sup> Heppenheimer, *Space Shuttle Decision*, 161-2.

create very strong pressures on the President to commit him and the Nation prematurely to a large and continuing space budget.<sup>171</sup>

Whitehead also expressed the belief that Nixon wanted to reduce NASA's budget from \$3.7 billion in 1970 to below \$3 billion (and perhaps as low as \$2.5 billion) in 1971.<sup>172</sup> This impulse would be addressed by BoB director Mayo, who was unwilling to reduce NASA's budget to \$2.5 billion. Mayo began an internal BoB study that started with the \$3.7 billion allocation for 1970 and explored the consequences of reducing it further. The first option, estimated at \$3.5 billion a year, cancelled the nuclear engine, *NERVA*, and closed the *Saturn V* and *Apollo* production lines, but kept *Skylab*, with three crewed visits, and six *Apollo* moon missions. This option would also allow for a space shuttle and a permanent space station by the end of the 1970s. A second budget option, priced at \$2.5 billion, continued *Skylab*, again with three crewed visits, six *Apollo* lunar missions, and a permanent space station, carried into orbit on *Titan IIIs* and using *Gemini* capsules for transportation to and from; however, it would not provide a space shuttle, and the Marshall Space Flight Center in Huntsville would close. A third price point, at \$1.5 billion, would take NASA out of human spaceflight altogether after *Apollo 14*; Marshall, the Manned Spacecraft Center in Houston, and the *Saturn* facilities at the Kennedy Space Center in Florida would all be shuttered; but NASA would still be able to maintain its robotic missions,

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<sup>171</sup> Heppenheimer, *Space Shuttle Decision*, 160.

<sup>172</sup> Heppenheimer, *Space Shuttle Decision*, 161.

with six *Viking* Mars landers, and a *Voyager* mission to the outer planets of the solar system.<sup>173</sup>

By early September, the STG report was complete. Committee member Russell Drew was selected to brief the President at a meeting on September 15. “Nixon listened attentively, and met as well with STG members and observers, giving them opportunities to comment.”<sup>174</sup> The report recommended that NASA neither pursue a crewed Mars mission by 1981 (it was listed as an “eventual” mission, which is how Nixon would describe it in his later space policy statement), nor abandon human spaceflight altogether; Nixon agreed with both of these recommendations. The STG instead set out three options, one that would grow NASA’s budget to \$9.4 billion by 1980, a second that would grow the budget to \$7.65 billion by the same date, and a third that would grow the budget to \$5.5 billion. In its report, the STG favored the \$9.4 billion option, but the task force eventually settled on the low figure. The report did not list specific recommendations on programs, but instead mentioned possibilities: a trip to Mars; extension of moon missions and a permanent lunar base; a permanent space station; and a space shuttle.

While the report did not make specific suggestions, it did provide the following guidelines for post-Apollo programs:

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<sup>173</sup> Heppenheimer, *Space Shuttle Decision*, 161-2.

<sup>174</sup> Heppenheimer, *Space Shuttle Decision*, 167.

Focus: Develop new systems for space operations with emphasis upon the critical factors of: commonality, (2) reusability, and (3) economy.

Exploration and exploitation of space is costly with our current generation of expendable launch vehicles and spacecraft systems. This is particularly true for the manned flight program. Recovery and launch costs will become an even more significant factor when multiple re-visit and resupply missions to an Earth orbiting space station are contemplated.

Future developments should emphasize:

Commonality - the use of a few major systems for a wide variety of missions.

Reusability - the use of the same system over a long period for a number of missions.

Economy - for example, the reduction in the number of "throw away" elements in any mission; the reduction in the number of new developments required; the development of new program principles that capitalize on such capabilities as man-tending of space facilities; and the commitment to simplification of space hardware.<sup>175</sup>

This three-part recommendation would become the driving force behind the space shuttle—it was a single system with many uses, it would be reusable, and

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<sup>175</sup> Space Task Group Report, September 15, 1969.

it was supposed to be economical. These three elements were the overriding criteria for designing the next generation of crewed systems, and would affect NASA for the next forty years.

William Burrows observes that the most vital part of the STG report is its defense of human spaceflight:

The manned flight program permits vicarious participation by the man-in-the-street in exciting, challenging, and dangerous activity. Sustained high interest, judged in the light of current experience, however, is related to availability of new tasks and new mission activity—new challenges for man in space.<sup>176</sup>

The STG report reinforces the idea that humans that perform “heroic tasks” in space is mandatory to maintaining the interest and support of the public.

Robotic missions are cheaper and safer than crewed missions, but human spaceflight keeps the public interested in NASA.

Two weeks after the meeting, BoB director Mayo advised Nixon not to endorse any of the STG recommendations, because his support would cause increased NASA budgets and result in the President losing “effective fiscal control of the program.”<sup>177</sup> Any endorsements should come after review by the other government stakeholders. Nixon took the advice and put the report in his desk drawer, not making a decision on space policy for another six months.

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<sup>176</sup> Burrows, *Ocean*, 440.

<sup>177</sup> Kay, *Defining NASA*, 107-8.

Eventually, Nixon would reject all of the STG suggestions, save one. Although the space shuttle is listed in the STG report as one of the potential options, through a series of related decisions, it became the sole item of negotiation for NASA and its only hope of continuing human spaceflight; what had been conceived as a support vehicle for other programs would have to be justified as a standalone project.

### The Economic Case for the Shuttle

Richard Nixon sought to change the way that the nation spent its money. He reorganized the BoB to give it more power to manage and evaluate government programs. The new organization, called the Office of Management and Budget (OMB), would not only evaluate departmental budgets, but would also measure the effectiveness of the departments and programs. The OMB would have a much greater voice in the budgeting process than did the BoB, which was already a powerful group. Nixon, ever frugal, would now have increased control over how the government spent the people's money.

This change came at a time of need. Inflation was very high, spending on the war and on social programs was draining the federal coffers, and Nixon felt that drastic cuts in spending were urgently required. Domestic politics also played a role in this belief. Nixon was one of the few presidents of the 20<sup>th</sup> century, along

with George H. W. Bush, whose party did not control at least one house of Congress, so he was more susceptible to spending matters, since Congress controlled the purse strings. Majorities in both houses of Congress, regardless of party affiliation, were opposed to the current level of spending on space when there were more pressing social and domestic matters to address. As a result, Nixon “was constantly trying to co-opt liberal opinion on certain issues, such as welfare, to minimize liberal opposition to the war”<sup>178</sup> and to garner support for other legislation in the Congress. Nixon was not about to continue, or to increase, as Tom Paine had wished, NASA’s budget, which was seen by the public as too costly, although they were pleased with the results. Just as Johnson had found before him, Nixon knew that prosecuting the war and tending to social issues did not leave much desire or money left for the space program, which many critics saw as an unnecessary expense.

Where Kennedy had a space program that drove a budget, Nixon’s situation dictated a budget that drove a space program. Coming on the heels of a huge political boost to Nixon from the *Apollo* lunar landings, the budget he supported reflected the reality that Nixon did not desire to get out of the space business altogether—he did not want to be the president who ended human space flight (a dilemma that continues to confront contemporary presidents). Because of the mounting budget pressures and the desire to retain human spaceflight, the cost of the program became a paramount concern. NASA budgets would be lower for the near future, and NASA had to adjust to the new reality. The new procedures

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<sup>178</sup> Hoff, in *Myth*, 95.

put in place by the OMB regarding the budgeting process gave the OMB more power; they now played an active role in the budgeting process. In addition to having an abrasive personality, NASA Administrator Paine did not understand the old rules, and had even more difficulty understanding the new ones.

Neither Paine nor [his successor] Fletcher seemed to grasp the necessity of not only complying with, but actually understanding the new cost accounting methods instituted by the Johnson, Nixon, and Carter administrations. Neither grasped the importance of knowing the with whom in the Bureau of the Budget (BOB) and later the office of the Office of Management and Budget (OMB) they absolutely had to maintain relations in order to receive serious consideration for their projects during the complicated process that went into determining the yearly expenses of government.<sup>179</sup>

It was quite clear that Paine was not James Webb, who, while admittedly operating in a more NASA-friendly environment, had understood the intricacies of the budgeting process from his time spent at BoB under President Harry S Truman. In addition, Webb knew how the political portion of the budgeting game was played; although Kennedy did not like Webb personally (he felt Webb spoke too much), Webb, much like Lyndon Johnson, was an excellent politician. Paine, on the other hand, came to NASA from General Electric, where he was a Ph.D.-holding metallurgist and then a manager with no prior political experience. Paine made few friends in Nixon's administration or in the OMB, and his departure in

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<sup>179</sup> Hoff, in *Myth*, 95.

September of 1970 was viewed with relief by the Nixon administration. In a memo to Peter Flanigan, Clay Whitehead lays out what the Nixon administration needed from the next NASA administrator:

We need a new Administrator who will turn down NASA's empire-building fervor and turn his attention to (1) sensible straightening away of internal management and (2) working with OMB and White House to show us what broad but concrete alternatives the President has that meet all his various objectives. In short, we need someone who will work with us rather than against us, and will seek progress toward the President's stated goals, and will shape the program to reflect credit on the President rather than embarrassment.<sup>180</sup>

The exit of Paine left Deputy Director George Low as the interim director of NASA during arguably the most critical phase in NASA's history.

Shuttle proponents at NASA found themselves in a bind. When the shuttle was first proposed in the 1960s, it was part of an overall system, one that could ferry equipment and people to and from a permanent space station. When it became apparent that NASA would not gain approval for both the space station and space shuttle, NASA was forced to find another rationale that would justify the cost of the new system to the taxpayers. The STG report dictated that any new system would have to be utilitarian, reusable, and economical. The shuttle as

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<sup>180</sup> Whitehead Memo to Flanigan, February 6, 1971. (taken from Heppenheimer, *Decision*, 274).

envisioned was utilitarian—it could carry up to 7 astronauts into LEO, and had the capability for both deploying satellites and retrieving satellites that needed repair. It was reusable: the orbiter, taking the form of a space plane, could be used repeatedly, unlike the current *Apollo* system and its predecessors, all single-use systems. Some of the shuttle designs used a fly-back, piloted first stage on which the orbiter would be carried into orbit, also reusable. “Neither the space station nor [NASA’s] exploration goals had been approved, however, so NASA officials adopted a more utilitarian rationale. They turned to Earth-bound arguments, in particular the cost effectiveness of the system for delivering payloads into orbit. They promised to make the shuttle cost-effective when in fact their primary motivation for building it was not economic.”<sup>181</sup> The shuttle would be expensive to build. It featured all-new technology, new materials, and new techniques, some of which had yet to be invented. “One internal NASA memo set initial development costs at \$10 billion to \$13 billion. In order to get the shuttle program approved, NASA executives felt obliged to propose a shuttle design with start-up costs estimated at only \$5.5 billion, which required rocket engineers to [eventually] substitute two liquid-fueled boosters for the reusable first stage.”<sup>182</sup> Although shuttle reusability would cut down on recurring costs, the R& D costs were not in line with the Nixon administration’s budget priorities.

Interim Director Low’s personal papers indicate that he fully understood the budget situation. In January of 1970, he wrote that “The entire budget situation

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<sup>181</sup> McCurdy, *Space Station Decision*, 32.

<sup>182</sup> McCurdy, *Imagination*, 228.

has been tremendously confused. It is clear that in this period of inflation, the president has to balance the budget and this, of course, is the right thing to do.”<sup>183</sup> All concerned parties clearly saw little chance that NASA’s budget would be increased under Nixon, who only increased budgets in response to a crisis. Though some at NASA might have disagreed, he did not feel that the space program was in a crisis, even with drastically reduced funding.<sup>184</sup> Low found this out first hand from National Security Adviser Henry Kissinger, who told Low that “both he [Kissinger] and the President were very much for the space program and all that it represented. However, he indicated that at this time period, it was difficult for the President to support it publicly or to support it with large amounts of funds because of the overall economic situation in the country.”<sup>185</sup>

Within this new reality, Low searched for a way to fit the shuttle into the fiscally constrained budget, and the high development costs made this a difficult feat. Several days later, Low decided that shuttle functionality should be weighed against development costs, and that cost should be the main driver of the design:

We really need to state only one objective for the space shuttle: to develop a low-cost space transportation system. This implies that we must have low development costs as well as low operational costs. . . . The other factors that we have previously stated, such as cross-range, go around

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<sup>183</sup> George Low, Personal Notes No. 5, January 17, 1970, NASA Historical Office archives, page 1.

<sup>184</sup> Hoff, in *Myth*, 94

<sup>185</sup> George Low, Personal Notes No. 40, January 24, 1971, NASA Historical Office archives, page 3.

capability, fly-back capability, and even payload weight and size, should be categorized as requirements and not as objectives. Many of these requirements will be in conflict with the basic objectives and should therefore be examined in terms of overall cost before they are included.<sup>186</sup>

Much of this would be revisited when taking into account the Department of Defense's (DoD) requirements. NASA officials found themselves in the unfamiliar territory of selling the space shuttle to the White House, the OMB, and Congress on an economic basis rather than on the strength of capabilities and occupant safety, which were the traditional deciding factors. In past project funding cycles, cost had been a factor, but not the determining factor. The *Apollo* program also weighed time of development very heavily due to the priority of beating the Soviets to the moon. In short, with the *Apollo* program, time was more important than cost.

The present budget situation had reversed the paradigm. Economic factors now drove the decisions, and they took primacy over other factors; the space shuttle was being sold like a commodity, as a system that would drive down costs rather than provide superior capabilities and safety. Suddenly, the shuttle became a way to drive down launch costs for everything related to space exploration and research:

NASA officials sought to package the program in a way that fit the new ethic surrounding US space policy, which meant emphasizing its

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<sup>186</sup> George Low, Personal Notes No. 6, January 24, 1970, NASA Historical Office archives, pages 1-2.

economic benefits. A reusable spacecraft, they argued, would dramatically lower launch costs (as low as \$100 per pound), thereby providing “routine access to space.” This, in turn, would open up the space environment to more users than ever before: commercial opportunities and scientific research, for example, would be greatly expanded. In addition, since its costs were to be below that of expendable launch vehicles, the shuttle could be used to launch satellites (including those of the Department of Defense, a key selling point) and deep-space probes, as well as to repair, maintain, and even return objects from earth orbit.<sup>187</sup>

Out of this drive to sell the shuttle on an economic basis originated the mantra of “cheap and routine access to space.” The promise of cheap and routine access to space sold the idea of the space shuttle (and this promise continues to drive NASA and the NewSpace markets). Part of this argument was directed not just at Nixon, his advisors, and Congress, but at the American people, who were convinced that the government had been spending too much money in space. It was not just NASA advancing this public relations campaign, but also space advocates, who were also lobbying for an increased American presence in space. Howard McCurdy comments on this campaign: “Rather than announce that they needed larger developmental outlays, space advocates perpetuated the myth of cheap and easy space flight by announcing that the era had arrived. Dissent was largely ignored. Optimism prevailed. The public, as a result, was

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<sup>187</sup> Kay, *Defining NASA*, 112.

largely unprepared for a catastrophe.”<sup>188</sup> The idea of a shuttle was sold as not only a cheaper and easier, but a safer, means of access to space. This idea later came crashing down to Earth after the *Challenger* accident in 1986; the shuttle had proven not to be cheap, routine, or even very safe.

Roger Launius notes this subtle shift in the economic argument for the shuttle, one that he points out has affected the cost of space access ever since.

As a result of deliberations between NASA and the White House’s Office of Management and Budget, the question of access to space was shifted from ‘what is the least costly design for access to space’ to ‘what design will provide low-cost access to space.’ As a result, NASA’s rationale for the Shuttle become much narrower; and instead of talking about the benefits of the vehicle *in toto*, its rationale became just that it be low cost.<sup>189</sup>

This new emphasis, as we will see, caused NASA to offset costs by raising the number of planned flights for each shuttle, thereby presumably taking advantage of economies of scale. Since the shuttle would be too expensive to mass-produce, the number of flights per year had to be increased to drive the price down. The combination of reducing development costs, thereby forcing design compromises, and increasing the frequency of flights in a system that would be anything but routine, would unnecessarily decrease the safety of the shuttle itself.

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<sup>188</sup> McCurdy, *Imagination*, 229.

<sup>189</sup> Launius in *Space Policy in 21<sup>st</sup> Century*, 28.

Using the analogy of the airline industry to paint the space program as another potentially competitive market, shuttle advocates claimed that the US government had subsidized the airline industry until the equipment became sound enough and the flights numerous enough for the industry to become profitable and self-sufficient, and prices were thus driven down. This argument was used to sell the space shuttle, and to claim that the shuttle would drive down the cost of access to space. This was an incorrect analogy—the forces acting on a shuttle are manifestly greater than those acting on an airliner. As a direct result of this simple fact, space flight is inherently more dangerous, more difficult, and more expensive than operating an airline. The thinking that drove the comparison with the aviation industry was found to be faulty by the Rogers Commission that investigated the *Challenger* accident; the unrealistic launch schedule was found to be a potentially contributing factor because it greatly increased the stresses on the materials and system as a whole.

In addition to the argument for savings coming from an increased number of launches, NASA began to look at how the revenues that would be received for launching payloads would drive down the costs of operation. In effect, the space shuttle could be a profitable delivery service, taking the place of the ELVs currently in use. George Low notes this concept in an entry in his personal notes from March of 1970: “[M]uch of the cost savings for the shuttle will come from payload savings, as opposed to coming from the savings in operational costs. This makes it mandatory once again that all of NASA’s payloads should be

planned for the space shuttle.”<sup>190</sup> While Low argues here for all of NASA’s payloads to be launched by the shuttle, the thinking eventually turned to the shuttle carrying commercial payloads, as well as all military payloads, which we discuss below.

Not everyone at NASA was on board with the reduced cost rationale for the shuttle. According to Low, Wernher von Braun, who originated the space shuttle concept, was ironically not a supporter of the shuttle idea, and might have even opposed it. Apparently, von Braun felt that NASA estimates for developing the shuttle were unrealistic and that NASA could not afford it.<sup>191</sup> As it turned out von Braun was correct; NASA could afford neither the development nor the operations of the shuttle, and as we will see in Chapter Four, the high cost of the shuttle was to hobble NASA for thirty years.

#### Mathematica, Inc.

The stagnant state of the US economy, a declining public and congressional opinion of the necessity for a large space program, and a frugal President determined to get the US budget under control all contributed to a reduction of NASA’s budget request by one billion dollars, with more cuts likely on the way; as a result, NASA abandoned plans for a space station and instead focused solely

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<sup>190</sup> George Low, Personal Notes No. 16, March 28, 1970, NASA Historical Office archives, page 5.

<sup>191</sup> George Low, Personal Notes No. 57, October 31, 1971, NASA Historical Office archives, page 3.

on the shuttle. The new focus on a balanced US budget and the requirements of the newly-formed OMB had forced NASA to justify the shuttle on an economic basis. George Low commented on this rationale in retrospect in 1979 in a letter to John Logsdon:

The economic analysis was something that we were forced to do by the OMB, and it was probably wrong from the beginning for NASA to accept this approach. A major capability in space, like the shuttle, should not be sold purely on economic grounds, and, yet, once we had started the economic analysis, it was very difficult not to be wedded to it.<sup>192</sup>

To provide data to support its new rationale for the shuttle's providing cheaper and more routine access to LEO, NASA turned to a Princeton, NJ, think tank called Mathematica. Mathematica performed an economic feasibility study for the space shuttle in 1971, which was conducted by economist Klaus Heiss. The study, which cost NASA \$600,000, concluded that by conducting a particular number of flights per year, the shuttle could in fact save NASA money over ELVs, and these findings were used to justify the shuttle on economic grounds. The issue is that Mathematica's original findings did not justify the expense, so NASA instructed them "to recalculate the savings based on an almost mind-boggling 714 flights over that twelve-year period, or a little more than a flight a week with each flight carrying a 65,000-pound payload. The numbers were being bent with

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<sup>192</sup> Letter from George Low to John Logsdon, January 29, 1979, NASA History Office.

desperation.”<sup>193</sup> Later in the decision process Heiss determined that a particular configuration of the shuttles called TAOS (Thrust Assisted Orbiter Shuttle) would work under the budgetary conditions; this configuration involved an orbiter with engines, an external tank large enough to allow the orbiter engines to burn from liftoff to orbit, and two external strap-on boosters, which could be either liquid- or solid-fueled, would fall away at staging velocity.<sup>194</sup> While the Mathematica study was flawed in estimating the number of flights needed per year to achieve economic savings, whether due to Heiss or NASA’s dictum, Heiss was successful later in identifying the ultimate configuration of the shuttle. The liquid-fueled boosters were eventually abandoned in favor of solids in order to keep development costs down; solids were cheaper and less complicated, but unlike liquid-fueled boosters, could not be shut down in an emergency.

The assumptions going into the study were flawed. Rather than deriving a realistic number of flights per year for each orbiter, and calculating costs from that, Heiss was ordered to start with a desired figure of savings and determining the number of flights that it would take to achieve those numbers. The number of flights used to justify building the shuttle was unrealistically high, as high as 55 flights a year—in reality, the shuttle program was never able to achieve more than 9 launches, which it did in 1985 with 3 of the 4 existing orbiters. George Low later surmised that the Mathematica study had an “influential and unfortunate” effect on the shuttle decision because it supported the idea that the

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<sup>193</sup> Burrows, *Ocean*, 441.

<sup>194</sup> Heppenheimer, *Space Shuttle Decision*, 373.

shuttle was a great investment strictly on financial terms.<sup>195</sup> Heppenheimer comments,

The work of Mathematica was brilliant. If its sole purpose had been to allow one of Klaus Heiss's graduate students to win a PhD, it would have succeeded magnificently. At the OMB, however, key people hardly believed a word of it.<sup>196</sup>

The shuttle remained in limbo, without a sponsor in the Nixon administration, Congress, or in the OMB. The administration wanted a cheaper version of the shuttle, and the task was to find a way to build a program with the available budget.

### The Grand Compromise

During the early days of the Space Shuttle design in the 1960s, many types of design ideas were developed. The early thinking was that the permanent space station would be put into orbit by *Saturn*-class boosters, not by the shuttle itself. The shuttle was “merely a handmaiden, a logistics vehicle that was poorly defined,” according to Heppenheimer.<sup>197</sup> By 1970, the shuttle was the main vehicle pursued by NASA, and the *Saturn* boosters were exceedingly rare due to

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<sup>195</sup> Jenkins, *Space Shuttle*, 99.

<sup>196</sup> Heppenheimer, *Space Shuttle Decision*, 282.

<sup>197</sup> Heppenheimer, *Space Shuttle Decision*, 229.

budget cuts and production line closings. Any space station would now need to be built in modules, which increased the importance of the shuttle. With the postponement of the station, the shuttle needed to become an all-purpose vehicle, fulfilling the STG report's utility mandate. NASA would now need to find other customers aside from NASA for its payload launch services. They would turn to two other sources: commercial enterprises, such as telecommunications companies, and the Department of Defense (DoD).

NASA's relation with the DoD stretched back to before its founding in 1958. In 1955, when Eisenhower was formulating the first national space policy, there was a strong military/defense link with space. Eisenhower wanted, among other things, a reconnaissance satellite program run by the CIA and ICBMs for delivery of the US nuclear arsenal. The reconnaissance satellites would be put into orbit by ICBMs, which would become dual-use systems. Eisenhower would pursue this military objective under the guise of a civilian program. *Project Vanguard* was a Naval Research Laboratory (NRL) endeavor managed and designed by civilians, and headed by Milt Rosen. The project featured a launcher that was designed for civilian purposes, and integrated from other rockets, including the scientific-use *Viking*; *Vanguard* was given a civilian/science public face. Wernher von Braun's team in Huntsville, part of the Army Ballistic Missile Agency (ABMA) had a superior launcher, the *Jupiter-C*, but it was a version of the Army's *Redstone* missile, and von Braun's team was inextricably linked with the Third Reich, all of which constituted a public-relations risk. It was only after the *Vanguard* test flight failed on live television that von Braun was given permission

to use his system, which he had been developing in secret, and, working with MIT and JPL, his team put *Explorer-1* into orbit on January 31, 1958.

Eisenhower insisted that the proposed NASA space agency be a civilian organization, but it retained strong military ties. The early launchers were all modified ICBMs, and the astronauts were all military test pilots. The various branches of the US military also pursued separate space programs, although in 1956 the Army was limited to tactical missiles with a maximum 200-mile range. When NASA was created on October 1, 1958, it was given NACA, the Army's JPL, part of the Army's ABMA (including the von Braun team), and parts of the Navy's NRL. The *Saturn*-class of rockets started as the Army's *Super Jupiter* design and its *F-1* engines began as an Air Force project. While NASA was not a military organization, it had military genes.

In February 1961, the DoD signed an agreement with NASA that moving forward, neither organization would develop a new launch system without "seeking the consent" of the other.<sup>198</sup> Heppenheimer also reports that between 1958 and 1964, the DoD and NASA signed 88 major agreements binding them together, including a joint Aeronautics and Astronautics Coordinating Board (AACB) that coordinated launch vehicles, spacecraft, and crewed space flight, and that in 1966, the AACB researched concepts for reusable launch vehicles.<sup>199</sup> In light of this relationship, it is not surprising that NASA turned to the DoD for support in their quest to win budgetary support for their new launch vehicle, the shuttle.

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<sup>198</sup> Heppenheimer, *Space Shuttle Decision*, 199.

<sup>199</sup> Heppenheimer, *Space Shuttle Decision*, 201.

While the economic studies could be massaged to show the cost savings that the shuttle promised, the OMB was not convinced. There were simply not enough NASA payloads to justify the number of flights dictated by the economic analyses. NASA needed another customer or partner that would rely on the shuttle. NASA also needed an ally in their struggle, especially one that had significant clout and intimately knew the political process that had to be navigated in order to get the shuttle approved; that the Air Force had deep pockets and could help to pay for the staggering development costs made this partnership an even better fit. That ally would prove to be the DoD—NASA would need the support and development money of the DoD if they were to stay in the human spaceflight business.

NASA determined that they would need to carry all of the DoD's payloads to justify the shuttle. George Low documents this reality in his discussions with Bob Seamans, who had served as NASA Associate Administrator, Co-Chair of the AACB, and who now served as the Secretary of the Air Force; Low reports after a meeting with Seamans in late January of 1970 that Seamans "would not be able to support the space shuttle unless NASA would work jointly with the Air Force on it to meet Air Force requirements." He adds that "on the technical subjects, Bob and I saw eye-to-eye in that we both believe the most important thing is to build a shuttle that will get economical space operations for both the Air Force and for NASA. We also both agree[d] that we should not so over-

specify the shuttle that we [would] never be able to build one.”<sup>200</sup> The shuttle would now have to accommodate not only NASA’s requirements, but those of the Air Force, which would drastically change its configuration; the tricky part, they realized, was not to “over-specify” the shuttle. It would have to be even more utilitarian than had been originally envisioned in order to win and keep a critical ally. “According to an analysis by the President’s Science Advisory Council (PSAC), 12 different launch systems could be replaced ‘with a STS used jointly by both DoD and NASA as a national transportation system capability.’”<sup>201</sup> The shuttle would now need to be economical and satisfy the needs of the DoD—the game had changed again.

It was vital for NASA to have the support of the Air Force, but the Air Force did not need the shuttle (or NASA, for that matter) to the same degree. Although the Air Force had seen their Dyna-Soar winged spacecraft and MOL space station projects cancelled in the mid-1960s and had no way to put military astronauts into orbit, they still had several launch systems that could launch their payloads, which typically consisted of reconnaissance and communications satellites. This asymmetrical relationship tipped the balance of power in the Air Force’s favor, and the Air Force was in the perfect position to dictate the terms of the relationship. As Heppenheimer explains,

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<sup>200</sup> George Low, Personal Notes No. 7, January 31, 1970, NASA Historical Office archives, pages 1-2.

<sup>201</sup> Jenkins, *Space Shuttle*, 99.

These Air Force leaders knew that they held the upper hand. They were well aware that NASA needed a shuttle program and therefore needed both the Air Force's payloads and its political support. The payloads represented a tempting prize, for that service was launching over two hundred reconnaissance missions between 1959 and 1970. In addition to this, Air Force support for a shuttle could insulate NASA quite effectively from a charge that the Shuttle was merely a step toward sending astronauts to Mars.<sup>202</sup>

The shuttle's capabilities would have to be altered to accommodate those that the Air Force required, and negotiations between the two entities began.

The two sides met in Williamsburg Virginia, on January 19-20, 1971, to negotiate requirements, although "negotiate" is too strong a word; NASA, coming from a much weaker position, conceded to the Air Force everything it wanted. In addition, the Air Force would not have to contribute to the development process, but would instead be responsible for building its own launch site at Vandenberg, called SLC-6. The Air Force had some very specific requests due to the nature of their payloads. They demanded a 60-foot payload bay, the ability to fly polar orbits, an 1,100 mile cross-range glide capability and 40,000 pound polar orbit capacity, and a once-around capability that allowed the shuttle to return to Vandenberg Air Force Base in California after one orbit. The 60-foot payload bay was needed to both launch and retrieve the Air Force's Big Bird reconnaissance satellites, which were larger than a school bus. Previous reconnaissance

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<sup>202</sup> Heppenheimer, *Space Shuttle Decision*, 214-5.

satellites de-orbited film capsules, which were then snared in flight by a specially equipped plane, a complicated procedure; the ability to retrieve a spy satellite from orbit if necessary would be a big plus for the Air Force.

The 1,100-mile cross-range capability was also a key element of shuttle functionality for several reasons. Spy satellites could weigh up to 40,000 pounds and typically flew in polar orbits, which involve orbiting from pole to pole rather than the more common equatorial orbit of communications satellites. In executing a polar orbit, each orbit of 90 minutes finds the satellite (or shuttle in this case) approximately 1,100 miles away from its launch point. An 1,100-mile cross range capability would allow the shuttle to return to Vandenberg after only one orbit, which is critical since the orbiter/shuttle was designed to glide unpowered back to Earth after reentry. Because the shuttle would be launching and retrieving Air Force reconnaissance satellites to observe the Soviet Union, the ability to fly polar orbits from Vandenberg was a requirement. Another reason for the cross-range capability would be to ensure that in an emergency situation, the orbiter would be able to avoid coming down in the Soviet Union or China.

The Air Force wanted a once-around capability for two reasons. The first was to be able to abort back to the launch site, which would involve the 1,100 mile cross range, as described above. It also wanted to use the shuttle's capabilities to snatch Soviet satellites from orbit, place them in the payload bay, and return to Vandenberg after one orbit—the one orbit requirement is essential here to avoid

any Soviet anti-satellite defenses, and the Air Force thought it best to stay in orbit as briefly as possible when engaged in such missions.

The 60-foot payload bay would require a more massive and heavier orbiter and launch system than NASA had been planning, which would drive up costs, increase complexity, and decrease safety. The 40,000 pound polar orbit carrying capacity converted into a 65,000 pound equatorial orbit carrying capacity. These new requirements would ultimately become a benefit when the shuttle carried the ISS modules into orbit for assembly beginning in the late 1990s, but would require a different type of design than had been envisioned. The 1,100 mile cross-range capability would require large delta wings, eliminating the conventional wings that designer Max Faget had favored, and created a much larger surface area that would need to be protected from the heat of reentry, which would be done with thermal tiles, which proved to be extremely problematic. In addition, delta wings required the shuttle to glide much more steeply than planned, and perform a flare maneuver just prior to its high-speed landing. The high landing speeds ruled out most of the world's landing strips, since they would be too short to accommodate the shuttle, and put greater stress on the landing gear and brakes, which would need to be reinforced.

The Air Force would eventually testify to Congress on behalf of the shuttle, and their support mattered a great deal. NASA would now have the backing and clout of the Air Force in their corner, but the remaining hurdle was the requirement to win over the politicians in the OMB and in the White House, which was an entirely different matter.

## The Shuttle Decision

While Richard Nixon fully embraced the *Apollo* landings, even becoming part of the story with strategically placed phone calls and photo ops with the astronauts, he still would not commit to a future for NASA. He felt that other domestic and international priorities were more pressing, and decided not to make a decision at all for an extended period. In an unpublished manuscript on the space shuttle, John Logsdon wrote of the myriad factors that constrained planning for NASA:

In the final accounting, though, decisions on the future of the space program were constrained by the overall fiscal situation and by the President's priorities as they were expressed through the budget process. With respect to NASA, there was not any bias on the part of the President or anybody around the White House. . . . It was just that [Nixon could not] do all of what NASA was proposing because of the President's other priorities and the limited budget resources available.<sup>203</sup>

Another major factor in play was the personality of Nixon and how the structure of the White House reflected it.

Nixon did not possess the gregarious personality that Kennedy enjoyed; instead he was solitary, distrustful, and secretive. He did not like the chaotic environment of the White House from which Kennedy seemed to draw energy; Nixon sought order in his White House, and the structure he put in place

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<sup>203</sup> Logsdon MS, "From Apollo to Shuttle: Policy Making in the Post-Apollo Era," V-13.

guaranteed this. According to Nixon's White House advisors, his personality was "dominated by two prominent characteristics: a passion for order and a passion for solitude. Order insures that he receives a regular flow through familiar channels of the best advice the bureaucracy and his staff can give him. Solitude insures that when he receives the options he can safely disappear and, in an atmosphere of studied detachment, arrive at a decision."<sup>204</sup> With little patience for the distractions of human interaction, Nixon set in place a structure that restricted White House access to a select few advisors. Where Kennedy surrounded himself with aides, advisors, and cabinet heads, always seeking opinions and advice, Nixon worked best when "surrounding himself with committees and councils, delegating heavy responsibilities to trusted aides, [and] depending on a staff system of his own design," and that Nixon "deliberately sought to isolate himself from the minor irritations of government and husband his energies for major concerns."<sup>205</sup> Nixon not only spoke with a select few, but he also delegated many of his decisions to a trusted nucleus of advisors, his inner circle. This inner circle included White House Chief of Staff H. R. Haldeman and White House Counsel then Chief Domestic Advisor John Ehrlichman (both later of Watergate fame), Director of OMB George Shultz, and Deputy Director of OMB Casper Weinberger (both later members of the Reagan cabinet), among others. This method of working made it less likely that Nixon

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<sup>204</sup> Semple, "Nixon Executive Style Combines Desire for Order and Solitude," p.1, 32.

<sup>205</sup> Semple, "Nixon Executive Style Combines Desire for Order and Solitude," p.1, 32.

would act decisively in support of NASA after the STG rendered its report in 1969, but would instead spend time delegating and stalling.

According to Nixon's aides, who perhaps knew him best, he was a fan of the space program, especially of human spaceflight. Ehrlichman claimed in 1983 that the President thought

there should be some form of continuing manned space flight program; an unmanned program didn't have any magic. . . . I can remember Nixon coming off a phone conversation with the astronauts. And you know, they are up on the moon, and [Nixon was] as high as a kite. He got a big charge out of them. Then when the astronauts would come to the White House for dinner afterwards, he would always be enormously stimulated by contact with these folks. He liked heroes. He thought it was good for this country to have heroes. . . . He had this metaphysical thing about national morality and national fiber and national ideals.<sup>206</sup>

Much evidence suggests that Nixon considered astronauts to be symbols of the best that America had to offer. Ehrlichman also reported on Nixon's persistent belief that space flight was instrumental to national prestige. To maintain America's favored status in the world, it had "to be at the leading edge of applied technological development . . . If we were not, a great deal of national virtue was

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<sup>206</sup> Logsdon MS. "From Apollo to Shuttle: Policy Making in the Post-Apollo Era," V-12.

lost, and [*sic*] our standing in the world.”<sup>207</sup> As he did while Vice President, Nixon still believed that a robust space program was a source of prestige.

Heppenheimer also tells of Nixon’s interactions with astronauts and the connection to foreign policy:

Like other presidents before and since, he basked in the reflected glory of spacefarers. When the crew of *Apollo 11* returned from the first landing on the moon, he was aboard the aircraft carrier *USS Hornet* to greet them. He then used this triumph to gain diplomatic advantage, for after hailing the achievement, he set out on a nine-day world tour that took him to capitals in Southeast Asia, India, Pakistan, and Europe. Significantly, he had planned this tour well in advance of the *Apollo 11* flight, anticipating its safe return.<sup>208</sup>

Nixon’s forte as President was his skills in foreign policy and geopolitics; had not his baser personality traits led to his demise with Watergate, he likely would have been remembered as one of the better foreign policy presidents, having successfully mitigated the Cold War by bringing on *détente* with the Soviet Union and opening up Communist China to the West. As a result of Nixon’s penchant for foreign policy and to negotiate rather than confront, Tom Paine’s entreaty to Nixon to approve a Mars mission before the Soviets announced a space station policy did not have the impact it would have had on Kennedy or perhaps even

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<sup>207</sup> Logsdon MS. “From Apollo to Shuttle: Policy Making in the Post-Apollo Era,” V-13.

<sup>208</sup> Heppenheimer, *Space Shuttle Decision*, 389.

Johnson. The US under Nixon was no longer racing the Soviets, but looking to coexist with them. Nixon did not feel compelled to “use the space program to prove himself able to deal with the Soviets, as Kennedy and Johnson apparently thought they did.”<sup>209</sup> Although Nixon enjoyed beating the Soviets to the moon, and reaped innumerable political benefits from it, he was more inclined to cooperate with them in space. “Although Nixon spoke of the *Apollo 11* mission as the ‘most exciting event of the first year of my presidency,’ his presidential papers document clearly that his personal interest was more in the diplomacy of space.”<sup>210</sup> That being said, Nixon considered the *Apollo* program the legacy of Kennedy and Johnson, two political enemies and men he detested, and partially for that reason, ended the program prematurely during its most historic moments.

During a later meeting between George Low and Nixon in 1972 (their only meeting) to announce the space shuttle decision, Nixon expressed that he was “most interested in making the space program a truly international program” and that Nixon “wanted us to stress international cooperation and participation for *all* nations. He said that that he was disappointed that we had been unable to fly foreign astronauts on *Apollo*.”<sup>211</sup> Nixon’s desire to cooperate with the Soviet Union was the essence of *détente*, a method to co-opt them by enticing them into the interconnected matrix of the larger international community, where the more destructive elements of Soviet foreign policy would damage any benefits they

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<sup>209</sup> Hoff, in *Myth*, 93-4

<sup>210</sup> Hoff, in *Myth*, 97.

<sup>211</sup> Memorandum from George Low, January 12, 1972, NASA History Office.

enjoyed from being a cooperative member of that community; according to the *weltanschauung* of Nixon and Kissinger, this strategy would “preserve international stability by according the Soviet Union a greater stake in the status quo.”<sup>212</sup>

Low recounts an illustrative anecdote that sheds light on Nixon’s interest in the space program. When Nixon welcomed the newly-returned *Apollo 12* crew at the White House, astronaut Pete Conrad was alarmed that Nixon showed no interest in the mission details and, when asked about the future of the space program by Conrad, Nixon quickly changed the subject to small talk. In a panic, Conrad called George Low and told Low that “the only note of interest concerned the proposed world tour for the *Apollo 12* crew. Here the President was more interested and said he would personally play a major role in planning which countries would be visited and how the visit should be conducted.”<sup>213</sup> As much interest as Nixon took in the space program as a tool of foreign policy, which was in line with the views he revealed to the Greenewalt Committee in 1959, it was obvious that he considered it much more than that: “Although there were certainly international and national security aspects to the space program, in the Nixon White House issues related to NASA were handled through the channels

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<sup>212</sup> Hoff, in *Myth*, 110-11.

<sup>213</sup> George Low, Personal Notes No. 1, January 1, 1970, NASA Historical Office archives pages 14-15.

set up for the President's domestic policy agenda."<sup>214</sup> NASA was a domestic program, and Nixon largely saw it in those terms.

As Nixon's Chief Domestic Advisor, Ehrlichman was a major influence on Nixon regarding domestic policy. And any decision that Nixon, Ehrlichman, or any of the trusted inner circle, consummate politicians all, would make on the shuttle would ultimately be a political one. The thinking of Nixon and his advisors, according to Ehrlichman, was that "the country had had enough excitement" after Apollo and that "bold new adventures were not needed." "[E]verybody recognized that the Apollo program had a lot of payoffs for any president"; however, "we didn't get much credit" for starting a new program that would pay off politically after the maximum eight years of Nixon's presidency. Nixon, ever frugal and ever political, had the belief regarding a new space project that "I'm not going to be around then and you are not going to spend my money on those kinds of things." Ehrlichman commented that "there was a good deal of that [attitude] in the approach to NASA from a political standpoint, [though we] recogniz[ed] at the same time that it had a life of its own and we could not terminate it."<sup>215</sup> This was also the view of the inner circle. But because Nixon's trusted advisors were the ones who did the legwork on projects and policies, the space shuttle decision was in limbo without a sponsor to shepherd it, fully

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<sup>214</sup> Logsdon MS. "From Apollo to Shuttle: Policy Making in the Post-Apollo Era," V-12.

<sup>215</sup> Logsdon MS. "From Apollo to Shuttle: Policy Making in the Post-Apollo Era," V-13.

developed, to Nixon with a recommendation. The call for a space shuttle went largely unheard by Nixon's advisors.

Nixon had no close advisors promoting the space program as he did on the major domestic initiatives he undertook. Put most simply, NASA administrators Thomas O. Paine and James C. Fletcher, and even Nixon's first two science and technology advisors, Lee A. DuBridge and Edward E. David, Jr., did not have the ear of Nixon or any of Nixon's inner staff.<sup>216</sup>

The buffer provided by the firewall that his advisors maintained between Nixon and outside agencies insulated the President from the debate and shielded him from having to make a decision either way. OMB had been hashing out details with NASA on economic terms, but had yet to pass a recommendation up the hierarchy to the President. This lack of interest and sponsorship among the inner circle was not lost on Low, who wrote a decade later,

The single most significant factor affecting the space shuttle decision was that there was no top-level leadership in the White House. President Nixon was unwilling to deal with his agency heads and dealt solely with his staff. This placed a great deal of decision-making responsibility with the OMB, and by definition the OMB is far more interested in short-range budgetary problems than in the long-range future of the nation.<sup>217</sup>

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<sup>216</sup> Hoff, in *Myth*, 94.

<sup>217</sup> Letter from George Low to John Logsdon, January 29, 1979, NASA History Office.

Low felt the frustration that Paine had felt earlier and was even less likely to get the President's ear since Paine had made such a negative impression on Nixon. This circumstance was in stark contrast to the Apollo decision, in which Kennedy made the decision himself after soliciting input from a host of advisors and stakeholders. By contrast, Nixon provided no leadership on the matter of the NASA budget or the space shuttle decision, aside from the general mandate that the federal budget needed to be reduced and that the US could not leave the arena of human spaceflight.

The space shuttle did have one political factor working in its favor. Congress had cancelled the SST project, which further hurt the recession-impacted aerospace industry. Much as Robert McNamara had felt during the deliberations over the *Apollo* decision, a space project would shore up an aerospace industry in recession and would win political support from potential donors in the upcoming election. And Ehrlichman helped Nixon to embrace this view: he "pointed out to Nixon that some 'close' states controlling large numbers of electoral votes were also those with space industries that would benefit from the new space shuttle program."<sup>218</sup> Cancelling the human space program was now certainly out of the question, and approving the shuttle could provide a political win for Nixon.

Nixon also realized that the US national defense depended on the maintaining the skill set of the US aerospace industry, so keeping the industry in business was in the best interest of the nation.

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<sup>218</sup> Hoff, in *Myth*, 109.

Neither President Nixon nor Vice President Agnew had any particular interest in the space program except perhaps as it fed a large industry, somehow contributed to national security, and could be milked for political advantage at home and abroad. In other words, space was making the transition from luxury to necessity, and therefore it could not be allowed to languish. So new goals had to be found.<sup>219</sup>

To this end, Nixon commissioned a committee to study steps that the government could take to harness the power of the flagging aerospace industry to solve the nation's problems. Formed in the latter part of 1971, the committee, called the New Technology Opportunities Program (NTOP), was headed by William Macgruder, former head of the ill-fated SST program. Ehrlichman assisted in the effort, sending out letters to various government agencies, in a scene reminiscent of Kennedy's request for Johnson to find a space project that would give the US space primacy. NTOP proposals included building high-speed rail in the Northeast corridor; developing two-way television; integrated utilities that would combine power, sewage, heat, light, and waste disposal through single units in office and apartment buildings; peaceful uses of nuclear weapons; offshore oil terminals for tankers; and other ideas. In the end, none of them was approved, NTOP died, and only the shuttle seemed ideal for buoying the aerospace industry.

NTOP nevertheless was important, for it represented a serious White House attempt to redirect the resources of aerospace toward new

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<sup>219</sup> Burrows, *Ocean*, 439.

domestic priorities. When the attempt faltered, it soon became clear that Nixon would not try to help the beleaguered aerospace industry by having its people work on mass transit or pollution control. Instead, he would give them an election-year gift by keeping that industry's resources within the realm of aerospace.<sup>220</sup>

Still, the shuttle had no champion within Nixon's circle of advisors.

Nixon had appointed James Fletcher, the President of the University of Utah and a PhD physicist who had previously been a Vice President at Aerojet, as Paine's successor as NASA Administrator (Low had been Acting Administrator). Fletcher was seen by Nixon's staff as someone who would be easy to work with and as someone who would not be committed to empire-building; this satisfied the description of the ideal administrator as outlined in Whitehead's memo to Flanigan (discussed above). Fletcher took office on May 1, 1971, and, recognizing the budgetary realities being imposed by OMB, he adopted a phased approach to shuttle development. Six weeks after he assumed the post, he approved the TAOS configuration suggested by Klaus Heiss, with an external tank and two solid boosters, which would eventually become the final configuration. NASA had agreed to build the shuttle that they could afford, not the one they wanted, which would have a piloted first stage—that design would have to wait. Marshall Space Flight Center, still under von Braun's direction in Huntsville, had been pushing for liquid-fueled boosters to justify their existence,

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<sup>220</sup> Heppenheimer, *Space Shuttle Decision*, 395.

but solids were cheaper to develop. NASA would eventually abandon the phased approach and settle on what had been intended as an intermediate approach, with an external tank and strap-ons, as the preferred configuration. Many questions remained to be answered, however: what NASA's budget would be, what the final configuration of the orbiter would look like, and whether the President would approve a shuttle at all. And the shuttle still had no champion within Nixon's circle of advisors.

That support was soon to come from an unlikely source—from within OMB. During the course of the OMB budget negotiations with NASA, the OMB argued against the shuttle program and wanted to further cut the NASA budget to \$2.8 billion, a funding level that would certainly mean the end of human space flight. Caspar Weinberger, Deputy Director of OMB and trusted Nixon advisor, acted as Nixon's main conduit to the shuttle negotiations and, along with OMB assistant in charge of NASA budget initiatives Donald Rice, Ehrlichman, and Flanigan, provided advice to Nixon on the shuttle issue. When he learned of the \$2.8 billion budget figure, Weinberger decided to act. Weinberger, who Low described as "a real space buff" and as "the only one in OMB really positive toward the NASA program,"<sup>221</sup> was the only one of Nixon's four trusted shuttle advisors who was in favor of funding a shuttle. Weinberger actively opposed recommendations from OMB staffers who suggested cutting shuttle funding from NASA's budget.<sup>222</sup> He believed that the \$2.8 billion budget figure would not only

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<sup>221</sup> George Low, Memo for Record, November 15, 1971. NASA History Office.

<sup>222</sup> Hoff, in *Myth*, 108.

kill the shuttle, but also two *Apollo* missions (in addition to the three Nixon had already cut) and *Skylab*—that in essence, the US would be out of the human spaceflight business. On August 12, 1971, Weinberger wrote a memo to Nixon that saved the shuttle and human spaceflight:

From: Caspar W. Weinberger

Via: George P. Shultz

Subject: Future of NASA

Present tentative plans call for major reductions or change in NASA, by eliminating the last two *Apollo* flights (16 and 17), and eliminating or sharply reducing the balance of the Manned Space Program (*Skylab* and Space Shuttle) and many remaining NASA programs.

I believe this would be a mistake.

1) The real reason for sharp reductions in the NASA budget is that NASA is entirely in the 28% of the budget that is controllable. In short we cut it because it is cuttable, not because it is doing a bad job or an unnecessary one.

2) We are being driven, by the uncontrollable items, to spend more and more on programs that offer no real hope for the future: Model Cities, OEO, Welfare, interest on the National Debt, unemployment compensation, Medicare, etc. Of course, some of these have to be

continued, in one form or another, but essentially they are programs, not of our choice, designed to repair mistakes of the past, not of our making.

3) We do need to reduce the budget, in my opinion, but we should not make all our reduction decisions on the basis of what is reducible, rather than on the merits of individual programs.

4) There is real merit to the future of NASA, and its proposed programs. The Space Shuttle and NERVA particularly offer the opportunity, among other things, to secure substantial scientific fall-out for the civilian economy at the same time that large numbers of valuable (and hard-to-employ-elsewhere) scientists and technicians are kept at work on projects that increase our knowledge of space, our ability to develop for lower cost space exploration, travel, and to secure, through NERVA, twice the existing propulsion efficiency for our rockets.

It is very difficult to re-assemble the NASA teams should it be decided later, after major stoppages, to re-start some of the long-range programs.

5) Recent *Apollo* flights have been very successful from all points of view. Most important is the fact that they give the American people a much needed lift in spirit, (and the people of the world an equally needed look at American superiority). Announcement now, or very shortly, that we were cancelling *Apollo 16* and *17* (an announcement we would have to make very soon if any real savings are to be realized) would have a very bad

effect, coming so soon after *Apollo 15's* triumph. *It would be confirming, in some respects, a belief that I fear is gaining credence at home and abroad: That our best years are behind us, that we are turning inward, reducing our defense commitments, and voluntarily starting to give up our super-power status, and our desire to maintain our world superiority.*

America should be able to afford something besides increased welfare, programs to repair our cities, or Appalachian relief and the like.

6) I do not propose that we necessarily fund all NASA seeks — only that if we decide to eliminate *Apollo 16* and *17*, that we couple any announcement to that effect with announcements that we *are* going to fund space shuttles, NERVA, or other major, future NASA activities. We could perhaps base any announcement of curtailment of *Apollo 16* and *17* on the ground that *Apollo 15* was so successful in gathering needed data that we can now shift, sooner than previously expected, to the Space Shuttle, Grand Tour, NERVA, etc. Also, I am certainly not suggesting that we give up our attempts to have NASA increase its efficiency, and eliminate waste or unnecessary expense in its base or elsewhere.

7) I believe I can find enough reductions in other programs to pay for continuing NASA at generally the \$3.3 - \$3.4 billion level I propose here. This figure is about \$400 - \$500 million more than the present planning

targets. This would mean finding reductions elsewhere, so as to stay within the \$250 billion figure that is now our goal.<sup>223</sup> [emphasis mine]

Weinberger knew exactly how to appeal to Nixon—by claiming that drastically cutting the NASA budget and getting out of human spaceflight would be an admission to the world that the US was abdicating its superpower status and that “our best years were behind us.” Weinberger would certainly have known that Nixon would find this idea revolting; like Weinberger, Nixon believed in American exceptionalism and felt that America had a role to play as the leader of the free world. While cutting the US budget was a priority, the reasons why it was high were related to priorities and budgets that had been inherited from the previous administration and from the opposition party. To cut the NASA budget simply because it was easier than cutting social programs was not the right answer, especially since the world would then see America as a weaker nation. The argument was clever, and it was pitch-perfect in appealing to all of Nixon’s core beliefs and foibles: the need for geopolitical strength, the need to avoid political pitfalls, the need to cut the budget, the need to address social issues, the need to support the aerospace industry, even an appeal to Nixon’s loathing of Lyndon Johnson. It is all there in one memo, and it worked both perfectly and immediately. The proof of its effectiveness is scrawled across the top of the memo in Nixon’s hand: “I agree with Cap [Weinberger].” The shuttle now had its champion inside Nixon’s inner circle, and it once again had a fighting chance.

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<sup>223</sup> Caspar Weinberger, Memorandum for the President, August 12, 1971. NASA History Office.

Nixon's sudden conversion was not known by the rest of the OMB staff until OMB Director Shultz received a staff memo in mid-September that read:

*The President read with interest and agreed with Mr. Weinberger's memorandum of August 12, 1971 on the subject of the future of NASA.*

*Further, the President approved Mr. Weinberger's plan to find enough reductions in other programs to pay for continuing NASA at generally the 3.3 - 3.4 billion dollar level, or about 400 to 500 million more than the present planning targets.<sup>224</sup>*

NASA was still in the dark about Nixon's change of heart. However, when things looked bleak, when Fletcher and Low considered abandoning the shuttle altogether, Fletcher sent a letter to Shultz on September 30, 1971, containing a FY1973 budget request totaling \$3.385 billion, including \$228 million for shuttle development. At an OMB meeting with NASA on October 22, 1971, the OMB staff recommended cancellation of the shuttle program. Weinberger opposed their recommendation, but did not overrule them. The staff said that if a shuttle would be built, it could be done more cheaply than NASA had suggested. Weinberger compromised and decided that a shuttle would be built, but that another review would be required to determine where costs could be further cut. One month later, on November 22, Low submitted NASA's recommendations for a list of cheaper shuttle options that ranged from an orbiter with a variety of

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<sup>224</sup> Heppenheimer, *Space Shuttle Decision*, 368.

booster types to a low-cost, unpowered glider that would be launched on a *Titan-III* booster. OMB's proposals featured a similar glider on a *Titan-III* as their most expensive option, and a variety of smaller glider/booster options that were less expensive. Low argued convincingly against the unpowered glider concept at a later OMB meeting.

On December 2, 1971, OMB sent Nixon a memo soliciting his opinion on space policy, and included a place for him to approve or disapprove various options, including a "reduced-cost smaller Space Shuttle program," the *Apollo Soyuz* mission, *Apollo 16* and *17*, and other Earth-orbiting missions. A week later, Nixon approved a shuttle, but a smaller version with a 30-foot bay and a capacity of 30,000 pounds. Fletcher would not accept this decision. The fight over the shuttle was not over.

The OMB effectively killed the Air Force's involvement with their suggestion of a smaller payload and decreased capacity, making the OMB-recommended shuttle too small to carry the DoD's reconnaissance satellites. This design would consign the Air Force to continue using *Titan-III* launch vehicles as their primary launch vehicle. Charles Donlan, acting Director of the NASA's Shuttle Program Office, decided to revisit the 1,100 mile cross-range capability requirement to determine whether they could cut additional costs by abandoning the delta wing and reverting to Faget's conventional wing design. Donlan determined that the high cross range would enable a more abort possibilities and make the shuttle safer. A delta wing would be inherently more stable at both super- and sub-sonic

speeds and from various angles of attack. NASA and the OMB met multiple times and made offers and counteroffers until a meeting with George Shultz and key White House advisors was scheduled for December 29, 1971. Fletcher and Low had prepared to accept a much smaller shuttle, one with a 45-foot cargo bay and a 40,000 pound capacity rather than the configuration desired by the Air Force, which was a 60-foot bay with a 60,000 pound capacity. Low describes the meeting as follows:

On the 29<sup>th</sup> of December, Fletcher and I met with Shultz, Weinberger, Flanigan, David, Rice, and Rose to review our Shuttle recommendations. Before going to the meeting, Fletcher and I decided that we could accept something as small as 14x40' with a 40,000 lb. capability, but anything less than that would require a presidential decision. During the meeting Shultz looked at the facts and figures and decided that really the only thing that makes any sense, as NASA has said all along, is the 15x60'—60,000 lb. Shuttle capability.<sup>225</sup>

Donlan recalled in 1983 that according to Fletcher, Shultz said, "Well, what are you fooling around with that 45-foot configuration for? It doesn't cost that much more. Why don't you get the one you want — take the 60-foot one."<sup>226</sup> Willis Shapley, NASA Associate Deputy Administrator, in 1984 told the story slightly differently. His account has Shultz deciding, "If we're going to do it, let's do it

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<sup>225</sup> George Low, Personal Notes No. 61, January 2, 1972, NASA Historical Office archives, page 4.

<sup>226</sup> Heppenheimer, *Space Shuttle Decision*, 410.

right; let's do the big shuttle and forget about the Bureau of the Budget shuttle."<sup>227</sup> In his personal notes, Low brought out some other, more ominous factors in the final shuttle design. Several days after the fateful meeting with Schultz, he commented,

In trying to analyze what's wrong with the decision process, it comes back to the fact that there is nobody in the White House willing to make any decisions. Everybody feels that the issue of Shuttle size is too small an issue to take to the President, and of course they're right, but they're unwilling to let the Administrator of NASA make that decision. Therefore, they let their various staffs continue to do the work and continue to ask nickel and dime size questions without ever calling a halt to that procedure and say it's about time that we made up our mind and let's proceed. Short of going to the President, I see no way of avoiding this kind of mess, and yet the question is not one of going ahead with the shuttle at all but merely one of Shuttle size and weight, I would also agree that we should not take this kind of a decision to the President too early.<sup>228</sup>

With the President unwilling to make a decision himself or to participate in the decision-making process, the entire negotiation process took on the characteristics of a bureaucratic nightmare. By trying to simplify the presidential decision-making process, Nixon made the process infinitely more complicated for

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<sup>227</sup> Heppenheimer, *Space Shuttle Decision*, 410.

<sup>228</sup> George Low, Personal Notes No. 61, January 2, 1972, NASA Historical Office archives, page 6.

NASA. NASA finally got its shuttle, the one that the Air Force had specified, and although for NASA it was a compromise, it was still a spacecraft that would keep them in space for the foreseeable future. Many design decisions were yet to be made, but the shuttle would happen after years of indecision.

With the size issue finally settled by Nixon's advisors, Shultz made his recommendation to Nixon, who agreed. All that was left to do was to meet the President for the public announcement. NASA was asked to prepare a statement that the President could issue. The meeting occurred on January 5, 1972, when Low and Fletcher flew to the Western White House in San Clemente, California, where Nixon had stayed for the holidays. Nixon and Ehrlichman were to meet with Fletcher and Low for a 15-minute photo opportunity. The actual meeting went over by almost 45 minutes, and Nixon showed a genuine interest in the details of the shuttle program. Low recalls in his personal notes that "[t]he discussion was warm, friendly, and productive. . . . [Nixon] is obviously very much interested in space for the sake of exploration and space for the sake of what it means for the future of the United States."<sup>229</sup> Nixon asked questions about the shuttle and the space program in general, and made some observations:

The President wanted to know if we thought the shuttle was a good investment and, upon receiving our affirmative reply, requested that we stress the fact that the shuttle is not a '\$7 billion toy,' that it is indeed

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<sup>229</sup> George Low, Personal Notes No. 62, January 15, 1972, NASA Historical Office, pages 2-3.

useful, and that it is a good investment in that it will cut operations costs by a factor of 10. But he indicated that even if it were not a good investment, we would have to do it anyway, because space flight is here to stay. Men are flying in space and will continue to fly in space, and we'd best be part of it.<sup>230</sup>

Low reported that Nixon, ever the statesman, commented at the time on the foreign-policy aspects of space:

We also discussed with him the real possibility of conducting a joint docking experiment in the 1975 time period. The prospect of having Americans and Russians meet in space in this time period appeared to have great appeal to the President. . . . The President asked John Ehrlichman to mention both the international aspects of the shuttle and the USSR docking possibilities to Henry Kissinger."<sup>231</sup>

Nixon pointed out that he "liked the fact that ordinary people would be able to fly in the shuttle, and that the only requirement for a flight would be that there is a mission to perform."<sup>232</sup> The shuttle would democratize space and would be utilitarian, unlike Kennedy's *Apollo*, which only carried test pilots and was built for a sole purpose. This was to be Nixon's machine—he held the model of the shuttle during the entire meeting as if he would never give it up.

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<sup>230</sup> Memorandum from George Low, January 12, 1972, NASA History Office.

<sup>231</sup> Memorandum from George Low, January 12, 1972, NASA History Office.

<sup>232</sup> Memorandum from George Low, January 12, 1972, NASA History Office.

Nixon's statement, largely written by NASA's William Anders, was edited by Nixon in his own hand.

I HAVE decided today that the United States should proceed at once with the development of an entirely new type of space transportation system designed to help transform the space frontier of the 1970's into familiar territory, easily accessible for human endeavor in the 1980's and 1990's.

This system will center on a space vehicle that can shuttle repeatedly from Earth to orbit and back. It will revolutionize transportation into near space by routinizing it. It will take the astronomical costs out of astronautics. In short, it will go a long way toward delivering the rich benefits of practical space utilization and the valuable spin-offs from space efforts into the daily lives of Americans and all people.

The new year 1972 is a year of conclusion for America's current series of manned flights to the moon. Much is expected from the two remaining Apollo missions--in fact, their scientific results should exceed the return from all the earlier flights together. Thus they will place a fitting capstone on this vastly successful undertaking. But they also bring us to an important decision point--a point of assessing what our space horizons are as Apollo ends, and of determining where we go from here.

In the scientific arena, the past decade of experience has taught us that spacecraft are an irreplaceable tool for learning about our near-Earth space environment, the moon, and the planets, besides being an

important aid to our studies of the sun and stars. In utilizing space to meet needs on Earth, we have seen the tremendous potential of satellites for intercontinental communications and worldwide weather forecasting. We are gaining the capability to use satellites as tools in global monitoring and management of natural resources, in agricultural applications, and in pollution control. We can foresee their use in guiding airliners across the oceans and in bringing televised education to wide areas of the world.

However, all these possibilities, and countless others with direct and dramatic bearing on human betterment, can never be more than fractionally realized so long as every single trip from Earth to orbit remains a matter of special effort and staggering expense. This is why commitment to the space shuttle program is the right next step for America to take, in moving out from our present beachhead in the sky to achieve a real working presence in space--because the space shuttle will give us routine access to space by sharply reducing costs in dollars and preparation time.

The new system will differ radically from all existing booster systems, in that most of this new system will be recovered and used again and again--up to 100 times. The resulting economies may bring operating costs down as low as one-tenth of those for present launch vehicles.

The resulting changes in modes of flight and reentry will make the ride safer and less demanding for the passengers, so that men and women

with work to do in space can "commute" aloft, without having to spend years in training for the skills and rigors of old-style space flight. As scientists and technicians are actually able to accompany their instruments into space, limiting boundaries between our manned and unmanned space programs will disappear. Development of new space applications will be able to proceed much faster. Repair or servicing of satellites in space will become possible, as will delivery of valuable payloads from orbit back to Earth.

The general reliability and versatility which the shuttle system offers seems likely to establish it quickly as the workhorse of our whole space effort, taking the place of all present launch vehicles except the very smallest and very largest.

NASA and many aerospace companies have carried out extensive design studies for the shuttle. Congress has reviewed and approved this effort. Preparation is now sufficient for us to commence the actual work of construction with full confidence of success. In order to minimize technical and economic risks, the space agency will continue to take a cautious evolutionary approach in the development of this new system. Even so, by moving ahead at this time, we can have the shuttle in manned flight by 1978, and operational a short time later.

It is also significant that this major new national enterprise will engage the best efforts of thousands of highly skilled workers and hundreds of

contractor firms over the next several years. The amazing "technology explosion" that has swept this country in the years since we ventured into space should remind us that robust activity in the aerospace industry is healthy for everyone--not just in jobs and income, but in the extension of our capabilities in every direction. The continued preeminence of America and American industry in the aerospace field will be an important part of the shuttle's "payload."

Views of the earth from space have shown us how small and fragile our home planet truly is. We are learning the imperatives of universal brotherhood and global ecology--learning to think and act as guardians of one tiny blue and green island in the trackless oceans of the universe. This new program will give more people more access to the liberating perspectives of space, even as it extends our ability to cope with physical challenges of earth and broadens our opportunities for international cooperation in low-cost, multi-purpose space missions.

"We must sail sometimes with the wind and sometimes against it," said Oliver Wendell Holmes, "but we must sail, and not drift, nor lie at anchor." So with man's epic voyage into space--a voyage the United States of America has led and still shall lead.<sup>233</sup>

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<sup>233</sup> Nixon, "Statement Announcing Decision To Proceed With Development of the Space Shuttle," January 5, 1972.

In the drafting of his statement, Nixon was faced with one more decision—what to name the program. Various names were floated, in the style of *Mercury*, *Gemini*, and *Apollo*: Pegasus, Hermes, Astroplane, Skylark, even Space Clipper, which was proposed in one draft. Nixon settled on “Space Shuttle,” which was an appropriately utilitarian name for the new system. The shuttle would eventually be called something even more prosaic and utilitarian: the *Space Transport System* or *STS*.

The statement touches on all of the elements of the new culture: the Earth as a fragile place, the need for universal brotherhood, the need for ecological husbandry, the fact that by going into space, we will improve our lives on Earth. It also emphasizes the requirements of the STG report: utility, reusability, and economy. The statement announces the space shuttle as a new type of spacecraft for a new generation. It begins by using Turner’s frontier metaphor and ends with an appeal that deploys the Kennedy-esque rhetorical trope of space as a sea that must be sailed and as a voyage in which the United States must lead. Nixon, moved by his creation, waxed romantically on the subject of space.

The shuttle decision was largely made by Weinberger and Shultz—Weinberger fought for the shuttle against an OMB determined to kill it, and once it had become clear that Nixon would approve a shuttle, Shultz decided on the size. Following Nixon’s *modus operandi*, the decision was brought to him for an up or down vote. As was the case in the Nixon White House, his aides did all of the

heavy lifting, and Nixon gave it a thumbs up or down, much like a Roman emperor deciding on the fate of a defeated gladiator at the Coliseum. In the case of the shuttle, it received a thumbs-up. While Nixon was inclined to slash the NASA budget, Weinberger, a space buff, knew exactly how to appeal to Nixon to win his approval of an increased budget. It was, however, ultimately Nixon's decision.

The space shuttle decision stands in sharp contrast to Kennedy's *Apollo* decision. Kennedy asked for and received the input of advisors, experts, and stakeholders; Nixon's aides went through the same information-gathering exercises in the case of the shuttle decision. Kennedy was interested in the Apollo program as a way to revive his political fortunes and to boost world opinion of the US; Nixon had little to gain from approving the shuttle, other than avoiding becoming the president who cancelled the human spaceflight program and garnering some donations from the aerospace industry in the 1972 presidential campaign. Kennedy had real skin in the game, risking real political capital by appealing to Congress and the nation to support the moon program on live television; Nixon's decision was done in offices and meeting rooms, far from the attention of the public, without the benefit of one public speech in favor of the shuttle. Nixon issued only a single press release on authorizing the shuttle. Kennedy made his decision days after receiving the report outlining the results of Johnson's queries; Nixon's decision dragged on for years. Kennedy's decision came at a critical point in the Cold War, with the fate of the world in the balance during the darkest period of the Cold War; Nixon's choice also came at a critical

time, but a critical domestic time for America, in the midst of civil unrest, a growing counterculture, and economic hardship. Kennedy acted as a leader, personally selling the project and overseeing its implementation; Nixon acted as the topmost bureaucrat, only signing off on a decision that others had negotiated incrementally.

Kennedy gave the nation a destination that needed a system; Nixon gave the nation a system that needed a destination. While Kennedy gave NASA more than it could have dreamed, Nixon gave NASA much less than it wanted.

Kennedy enjoyed the company of astronauts, because they represented the *machismo* and heroism he valued personally, and he probably detected elements of himself in them; Nixon enjoyed the company of the astronauts because he could vicariously enjoy their exploits and thought that the country needed heroic symbols. Kennedy was a risk-taker; Nixon was a risk mitigator.

The two decisions could not have been more different; the two men who made them could not have been more different. Although the two decisions were influenced by their respective times and circumstances, the manner in which the decisions were made was imbued in each instance with the respective personality of each man.

## Aftermath

As the 1970s progressed, work continued on the design of the space shuttle, but the large, make-or-break decisions had been made. Nixon kept *Apollo 16* and *17*, *Skylab* and the three crewed visits, and, to his great joy, the *Apollo-Soyuz Test Project* (ASTP) mission. The ASTP was the embodiment of the spirit of Nixon in space—a foreign policy initiative by which *détente* was staged in orbit. Ostensibly undertaken to ensure cooperation between the two space superpowers and to improve safety by developing systems by which each space program could rescue the other in an on-orbit emergency—a concept that had been discussed in Kennedy’s time, but was unlikely to happen due to Cold War tensions and posturing—the mission was one that Krushchev would never have allowed. Such a mission would have afforded the US a first-hand view of Soviet technology, which would have shattered the illusion of Soviet space superiority that the USSR propaganda machine had built up over the years.

In a sense, it was Krushchev who drove the space race, with Eisenhower and then Kennedy reacting to Khrushchev’s propaganda-fueled spectacles. Eisenhower eventually agreed to a space program larger than he would have preferred after a series of successful *Sputniks* and US failures. Kennedy, whom Krushchev thought was green and thus easy to manipulate, reacted to Krushchev’s Gagarin move and the subsequent press frenzy, although it was the Bay of Pigs debacle that ultimately drove Kennedy to action. Krushchev continued to drive Kennedy into space until Kennedy’s death. By contrast, Nixon

personally clashed with Krushchev as Eisenhower's Vice President during the Kitchen Debate of 1959 in Moscow (which launched Nixon's reputation as an international statesman). However, Krushchev had been deposed by the time Nixon ascended to the presidency. Even if Krushchev had still been in power, the balance between the two space programs had shifted drastically toward the US program, which was only months away from landing on the moon when Nixon took office.

As Bob Dylan had sung in 1964, the times were a' changin', and that very palpable change was apparent to all by the late 1960s. Nixon would withdraw from an aggressive space program just as he would eventually withdraw from Vietnam. Nixon sought to extract America from its costly foreign entanglements, to create a more peaceful world abroad through diplomacy, and to win peace at home by tending to America's immediate social needs. "At the very moment when Apollo achieved full success and when NASA had the moon within its grasp, changing national priorities would prevent this agency from pursuing a follow-up program of extensive lunar exploration leading towards manned flight to Mars. Rather than going forward as a focus for the nation's hope, the space program would have to find its home in a prosaic world where the glow of Kennedy's challenge had faded, with many people viewing *Apollo* as a waste of money."<sup>234</sup>

NASA would survive the most turbulent period in its history, having to drastically downsize soon after the glories of *Apollo*. The space shuttle decision would

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<sup>234</sup> Heppenheimer, *Countdown*, 241.

serve as NASA's political baptism by fire, and would also serve as the model for NASA's next 40 years, a future of shrinking budgets and political dogfights.

Although the Kennedy model is widely viewed by the public as the way NASA gets its projects, the reality is much more like the Nixon model. Many at NASA themselves originally shared the same view: NASA officials viewed the shuttle decision as something of an anomaly, the result of having to negotiate program details without much consensus on long-range goals during a period of severe budgetary constraints. "The further NASA got away from the shuttle decision, however, the more the Apollo program started to look like the anomaly."<sup>235</sup>

The shuttle was NASA's only method of bringing crews into LEO when it debuted in 1981, and would remain so until 2011, when it flew its final mission. After that, NASA would rely on the Russian Space Agency and the *Soyuz* for rides to the ISS, something unthinkable in either the Kennedy or Nixon era. America had abdicated the primacy in space that had been won with treasure and tragedy. While the nation awaits the next chapter in American space history, the recent death of Neil Armstrong has prompted Americans to look back fondly to the heady days of Kennedy's bold challenge to go to the moon just 60 years after humanity's first flight, and also to wonder what happened to the spirit of daring that animated his challenge. The space shuttle program sought to make access to space routine, and that it did. As a result, Americans became bored with hundreds of similar shuttle missions, even though human spaceflight remained difficult and risky, only paying attention in times of tragedy, either after the loss of

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<sup>235</sup> McCurdy, *Space Station Decision*, 32.

lives in the two catastrophic shuttle accidents or in response to the costly near-fiasco of the Hubble Space Telescope and its heroic repair. Ever since the *Apollo 17* splashed down in the Pacific, NASA has sought to rekindle the nation's love affair with space; but we now live in a different era. This loss of heroes, daring missions, and amazing feats is sobering and disappointing for many; however, we should remain hopeful about the future of space exploration and of NASA.

## CHAPTER IV

### THE RECKONING

*Project Apollo* and the space shuttle program have dominated NASA for the past 50 years. *Apollo* is recalled fondly by space advocates and Americans of a certain age as representing the Golden Age of Space Exploration. The pleasant nostalgia was very evident at the recent celebrations of the 40<sup>th</sup> anniversary of the first moon landings and again, more recently, at the passing of *Apollo 11* astronaut Neil Armstrong. The era of *Apollo* is considered NASA's best of times, although the actual landings themselves continued for only three years. The shuttle era is largely absent that public feeling of heroism and adventure, instead instilled with the image of the shuttle program as being routine, perhaps boring, and being an astronaut as more akin to performing a job than acting bravely or heroically.

As Roger Launius wrote in his essay "Perceptions of *Apollo*: Myth, nostalgia, memory, or all of the above?" the *Apollo* missions have assumed a mythical quality in American culture. The *Apollo* program has come to represent different things to different people, who have in turn projected their own views onto the program. For some, *Apollo* represents the glorious and uniquely American pursuit of the "final frontier." Others see *Apollo* as the failed promise of NASA's

utopian vision of the future, one in which the people of the world would could achieve perfection by journeying to the stars, leaving their prejudices and imperfections behind; for these people, *Apollo* was a failure, as *Apollo* did not in any sense perfect society or bring the nations of the world closer together. For policy wonks, *Apollo* is seen as a triumph of the technocratic model, where wartime mobilization could be applied to solve peacetime problems. These people consider *Apollo* to be the one “good” government project. Space advocates view *Apollo* as a failed opportunity; a false start that should have been the beginning of a human diaspora throughout the universe. For Americans and space buffs who lived through the *Apollo* missions, the majority view is that of *sehnsucht*, or wistful nostalgia, either a pleasant memory of the *Apollo* era as the age of Kennedy and a time of innocence and dreams, or a memory resonant of the human tendency to reflect on one’s childhood as better times than the present, and of *Apollo* as emblematic of those better times. Spiritual people of the *Apollo* era saw the program as a secular religious experience, one that evoked emotions of awe, devotion, omnipotence and redemption; these people saw the space program in quasi-religious terms, with a new clerical caste (astronauts), new rituals (mission control activities), a sense of higher purpose, a new language (NASA jargon), and a theology of salvation (the promise of a new start in space). Wernher von Braun himself saw *Apollo* as a new beginning for mankind.

Another group of people, including those who personally participated in the program, view *Apollo* as a squandered opportunity for the next step in human

evolution. They feel that after the miracles wrought by *Apollo*, human spaceflight became a mundane LEO exercise performed without mystery by the space shuttle. This sense that space travel was quotidian stems from the fact that NASA did its job all too well. It was only after the two shuttle accidents that Americans were reminded of just how dangerous the flights still were, and of how brave astronauts are; the two shuttle accident reports stress these facts, along with the fact that NASA itself, while still striving for the ultimate safety of the astronauts, believed its own claims that flights were routine, safe, and that the risks could be managed.

These views, that *Apollo* was a mythical voyage and that the shuttle was a utilitarian workhorse, reflect how each project was originally sold. NASA discovered early on that, even before the first *Mercury* flight, the seven men selected as astronauts were considered heroes by the American people. *Life* magazine, which had negotiated exclusive access to the *Mercury* astronauts, sold them to the public as such, a product they could market to increase subscription rates and advertising revenue, and the public eagerly consumed the myths. What is surprising is that this marketing campaign began under Eisenhower's administration, which sought a modest space program, and not under Kennedy's. *Project Apollo* was championed by the Kennedy administration as a way for America to both beat back the advancing Soviet bear and fulfill America's unique human destiny—an exceptional people performing exceptional acts. Kennedy sold it as a holy quest, with an ever-looming time limit, a ferocious enemy, heroes pure of heart, great dangers to be faced, and

with a sacred prize to be won after great travail. After Kennedy (and arguably the *Apollo 1* astronauts) died, the project had a patron saint who had been martyred in the cause of good.

The shuttle had been sold to decision-makers and the public in an entirely different manner. Rather than resorting to a mythical and emotional appeal, it was sold rationally, using a more practical argument. Keeping in line with the recommendations that the STG report outlined, the shuttle was marketed as a safe, reusable, economical, and utilitarian system. In a time of changing priorities, it appealed to the new ethos—less wasteful, less costly, and less elitist. The shuttle was a versatile system that presented a more democratic way to get into space—even Nixon remarked that he liked how the shuttle would open space to regular people, including people from countries that could not afford their own space programs. NASA chose to sell the shuttle as a routine way to get into space to perform work rather than to explore. And the shuttle adequately performed this workhorse role for thirty years.

The popular dictum that time is money is true of the *Apollo* and shuttle decisions. In the case of the *Apollo* decision, Kennedy's mandate had emphasized a timeline of landing on the moon before the decade had elapsed. This time limit was the driving factor behind the entire program, and the appropriate funds were provided and design choices were made expressly to meet this deadline. As a result, *Apollo* successfully met this deadline, even with a decreasing budget after 1966 and a two-year hiatus after the *Apollo 1* fire. In the case of the shuttle, the OMB had indicated that the budget for development of a shuttle would be less

than half of what NASA had requested. As a result of this basic constraint, money rather than time became the dominant factor. The timetable for developing the shuttle was lengthened to accommodate the allocated funds, and the design choices, primarily compromises from designs that NASA had originally advocated, reflected the necessity of meeting economic requirements rather than any timeline. The development of the shuttle took about as long as the entire *Apollo* project did, a decade, but it came in over budget. Time and money were tradeoffs in each case, and can be considered the main influences on the ultimate configurations and operational processes in each space system. *Apollo* featured a policy determining the budget, while the shuttle featured a budget driving the policy. *Apollo*'s policy was a destination: the moon. The shuttle's policy was a concept: cost-efficient spaceflight. In essence, *Apollo* was a destination looking for a system, while the shuttle was a system looking for a destination.

### Evaluating Apollo

Thus, the question remains—was *Apollo* successful? Taken in terms of Kennedy's original mandate, the answer is a resounding yes. It safely landed not just one, but four humans on the moon by the end of the decade, and returned them safely to Earth. The US space program had surpassed the Soviet program at some point during *Project Gemini*, when it successfully docked two spacecraft, but *Gemini* had been undertaken as an intermediate project to develop the

techniques that *Apollo* would need to employ in order to land on the moon. The *Gemini* project's success, however, was not readily apparent to most non-space buffs. When *Apollo 8* orbited the moon, it was clear to the world that the US program was ahead of the Soviets', and *Apollo 11* fulfilled Kennedy's challenge by putting Americans on the moon before Soviets; to this day, no one but Americans have walked on another celestial body. Soon after the US moon landings, the Soviets quietly abandoned both of their clandestine crewed moon programs and turned their focus toward space stations.

*Apollo* brought unprecedented goodwill and prestige to the US after the *Apollo 11* success. Embarking on a world tour as soon as they had left their mandatory three-week quarantine, the *Apollo 11* astronauts visited New York, Chicago, and Los Angeles, where they were feted by the President, Vice President, congressional legislators, most state governors, and ambassadors from 83 nations. They then embarked on a 45-day, 25-nation goodwill tour, visited heads of state, and were attended by overflowing crowds at all points along the way. The lunar landing had been watched by almost the entire planet, except for some of the closed societies like the USSR and China, and the people of the world have probably never been in closer relationship before or since. It was hailed as an achievement by humankind, not just by Americans. Dozens of nations issued stamps celebrating the landings.

*Apollo* accomplished its goals remarkably well. Technologically, it was wondrous. In addressing the requirements of the program, many technologies and sciences were advanced rapidly. This is especially true with computing.

While *Gemini* featured an on-board computer to calculate orbital parameters, the *Apollo* systems were run entirely by computers. Due to limitations of computing power and memory size, the astronauts were required to load the operational programs for each phase of the mission one step at a time. However, the entire flight, from liftoff to lunar landing, from lunar liftoff to splashdown, was computer-controlled. The computer on which this was written owes a debt of gratitude to the *Apollo* engineers.

Considering whether *Apollo* was successful in a larger sense is more problematic. *Apollo* was born of the Cold War and of a sense of urgency, if not panic, and the decisions made in the course of prosecuting the project may therefore be questioned. By specifying the *Apollo* challenge as a race against time and the Soviets, NASA's objective became not just getting to the moon, but getting there as quickly as possible. As such, the decisions regarding the equipment designed and the procedures developed had both speed of attainment and a narrowness of purpose as strategic factors. All of the decisions regarding equipment were made to simply land on the moon, and not to derive a more utilitarian system that could be used effectively in a post-*Apollo* environment. The feat of going to the moon and back required equipment that was purpose-built for the specific challenges of that environment: the *Saturn V* launch vehicle, the *Apollo* CSM/LM system, and the Lunar Orbit Rendezvous (LOR) approach were all designed with landing on the moon as their only goal. The systems developed were prohibitively expensive, and were not practical for other non-lunar missions, although some of them were adapted as *Skylab* after

the final three *Apollo* missions had been cancelled—this was more of a retrofitting exercise than of designing mission-specific equipment. Because of the monomaniacal nature of the objective, not much thought was given to post-*Apollo* usage; engineering decisions were made to facilitate the short-term needs of landing on the moon and left NASA without a sustainable infrastructure. In the words of NASA Deputy Administrator Hans Mark, “Apollo was essentially a dead-end from the technical viewpoint.”<sup>236</sup>

The *Apollo Applications Project (AAP)*, out of which *Skylab* emerged, was an attempt to leverage *Apollo*-era equipment to keep the program alive after the moon landings ceased; this involved *Skylab* missions, and the *ASTP*, which featured a modified *Apollo* vehicle. *AAP* extended the *Apollo* program for several missions, but did not prompt new development. In fact, after the *ASTP* mission in 1975, America was left without a way to put humans into orbit, including no way to travel to *Skylab*, which deorbited in 1979 before the shuttle could come online.

The method Kennedy used to achieve the lunar landings, the large-scale, war-level, national mobilization method, was, in the final analysis extremely short sighted on the part of America’s leadership. In solving an immediate political problem, an inordinate amount of national treasure and effort was spent.

Because it was issued as a challenge rather than the coherent long-term policy that James Webb had advocated, when *Apollo* ended, NASA was left with very

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<sup>236</sup> McCurdy, *Imagination*, 186.

little political capital. When the BoB reviewed the *Apollo* decision years later, it seemed to understand this fact, but it framed the evaluation in terms of *Apollo* rather than the space program as a whole; in order to be successful, *Apollo* needed constant, steady support, and “a commitment to a long-term effort and to provide the resources it requires. Starts and stops, changes in goals, or failure to provide the required level of budgetary report would impair the success of the program.”<sup>237</sup> *Apollo* benefitted from all of these requirements for success, but the larger space program, which had been largely ignored during *Apollo*, did not. And when *Apollo* ended, the US space program became moribund.

By tying *Apollo* to national security, Kennedy was able to fend off critics of the program, especially those opposed to the high costs. W.D. Kay writes, “[D]efining space policy in a way that makes it essential to ‘national survival’ allowed *Apollo*’s supporters to answer—or, in some cases, ignore—criticisms of the program’s high costs, which began in earnest in 1961 and continued for the rest of the decade.”<sup>238</sup> These criticisms would come from within and outside of NASA. When first discussing the possibilities of beating the Soviets to the moon with Kennedy, NASA Administrator Webb balked at pursuing one large program, and instead favored a more balanced approach that included other initiatives: “President Kennedy considered that landing Americans on the moon was the major purpose of NASA’s priorities, while Administrator Webb disagreed, saying that the national objective was to become preeminent in space, and he would not

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<sup>237</sup> Logsdon, *Race*, 108.

<sup>238</sup> Kay, *Defining NASA*, 77.

take responsibility for a program that was not a balanced one.”<sup>239</sup> Vice Admiral Hayward also saw the dangers in this approach, stressing, as did Eisenhower earlier, a more orderly, structured space program over one large crash program that would preclude starting other space projects. Without this balanced approach, NASA “became what James Webb had feared, a one-program agency; given the budget constraints of the period, there was no money available for major new starts on alternative programs.”<sup>240</sup>

Others outside of NASA were critical of the project as well. Senator William Fullbright of Arkansas was a vocal opponent of the focus on the *Apollo* project as early as 1962, saying he was not against “the lunar goal itself, but rather the end-of-decade timetable, which added considerably to the cost of the program.”<sup>241</sup> Historian Arnold Toynbee pejoratively compared *Apollo* to the Great Pyramids, claiming that it was “rather scandalous, when human beings are going short on necessities, to do this,” implying that *Apollo* was unfairly built on the backs of the people.<sup>242</sup> By the time of the first moon landing in July of 1969, while worldwide interest in the achievement of *Apollo 11* was at its peak, public interest in the *Apollo* program itself had waned. One need only look at the *New York Times* on July 22, 1969 to gauge the mood of the country: of the 34 intellectuals and luminaries who gave their opinions on the achievement, half believed that it was

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<sup>239</sup> Emme in Durant, *Between Sputnik*, 70.

<sup>240</sup> Logsdon, *Race*, 242.

<sup>241</sup> Kay, *Defining NASA*, 79.

<sup>242</sup> Burroughs, *Ocean*, 423.

not worthwhile, and Saul Alinsky thought it only worthwhile had the entire Nixon administration been sent to the moon.

Historian Michael Beschloss takes a hard look at the Apollo project with hindsight and deems it a bad decision:

As Kennedy concluded, his decision for an accelerated Moon landing was ultimately a political decision made in terms of cold war strategy. How does it stand up now that the cold war is over? Not well. We now know that the reason the Soviet Union gave up in that struggle was that it recognized that it could not compete with the Western economies and Western societies in those areas of life and death that mattered. Although the Moon program contributed a great deal to the United States, the tens of billions of dollars spent in the 1960s on what Kennedy essentially thought of as world propaganda could probably have been better devoted to US defense or the American domestic economy, and that might have convinced the Soviets more quickly of the fruitlessness of the tragic conflict with the United States.<sup>243</sup>

Heppenheimer comments on the costs of the program: "*Apollo*, with a program cost estimated at \$12.0 billion in mid-1963, ballooned to \$21.35 billion by the time of the first moon landing in July 1969. That program indeed had fulfilled President Kennedy's promise by reaching the moon during the decade of the

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<sup>243</sup> Beschloss, in *Myth*, 63.

1960s, but only because it had drowned its problems in money.”<sup>244</sup> John Logsdon, while conceding that *Apollo* “turned out to be a dead end undertaking in terms of human travel beyond the immediate vicinity of this planet,”<sup>245</sup> comes to a different conclusion than Beschloss: “Perhaps the technological capabilities developed for *Apollo* were in fact too large and too expensive for subsequent regular use, but the principle that the United States should be the leading spacefaring nation has served the country well.”<sup>246</sup>

While *Apollo* was a glorious moment in American and human history, and a worthwhile endeavor, the decision to prosecute *Apollo* as an accelerated, quasi-military effort to the exclusion of other space projects was a mistake that would haunt NASA at the end of the *Apollo* program, and would influence their choice of the shuttle design and funding priorities. Further, the rather arbitrary timeline introduced exceptional costs that eroded public support for NASA, a critical error.

### Long-Term Effects of Apollo on NASA

*Apollo* affected NASA in the long term in two important ways: it set a precedent for large budgets and larger thinking that was hard to overcome; and it gave NASA its greatest moment of glory just a decade after its founding, one that it would likely never be able to recreate. Wernher von Braun commented that “the

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<sup>244</sup> Heppenheimer, *Space Shuttle Decision*, 253.

<sup>245</sup> Logsdon, *Race*, 240.

<sup>246</sup> Logsdon, *Race*, 226.

legacy of *Apollo* has spoiled the people at NASA. They believe that we are entitled to this kind of a thing forever, which I gravely doubt. I believe that there may be too many people in NASA who at the moment are waiting for a miracle, just waiting for another man on a white horse to come and offer us another planet, like President Kennedy."<sup>247</sup> That *Apollo* achieved so much and had been such a national priority caused NASA to develop an enlarged sense of entitlement. They reasoned that since it was they who had beaten the Soviets, they could set their sights on bigger and better projects. While in many ways *Apollo* was an end, NASA had the view that *Apollo* was only the beginning, and badly misread the mood of the national leadership and the populace concerning the program. Administrator Paine demonstrated this attitude of entitlement in the early discussions of NASA's post-*Apollo* future and in his interactions with the STG group, and this attitude proved to be counterproductive, if not nearly program-ending.

In lobbying the Nixon administration for a substantially larger budget than Nixon had in mind, NASA had not been able to recognize the new reality that, post-*Apollo*, they would not be handed a blank check. "In 1969, proud of having met the goal of taking humans to the moon, NASA officials trotted out their long-range plan for the exploration of space. . . . The results, for NASA, were disastrous. One of the surest ways to kill a long-range plan is to smoke it out before its advocates have lined up the necessary support. President Richard Nixon, to

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<sup>247</sup> Heppenheimer, *Space Shuttle Decision*, 152.

whom the plan was presented, rejected it."<sup>248</sup> As we discussed in the previous chapter, the game had changed radically, and Paine was the last person to realize it.

The mechanics of Kennedy's decision had become the script by which NASA wished to operate: the President made a speech, and everyone lined up with their support. The reality in Washington is nearly always the opposite, all the more when the President does not have a partisan majority in at least one house of Congress. George H.W. Bush unsuccessfully tried this technique with his Space Exploration initiative (SEI), as did his son, George W. Bush, with his ill-fated Vision for Space Exploration (VSE); SEI's high price tag doomed it with Congress, and VSE died after Bush did not follow up with adequate funding and it began to run behind schedule, finally to be cancelled by President Barack Obama. The difference with *Apollo* is that Kennedy had Congressional support lined up through the efforts of Lyndon Johnson and James Webb, and Kennedy brought the nation along with him after a series of effective speeches. In the case of the two Bushes, they did not do the legwork that would help to win congressional support and failed to get the approval of the public. The Kennedy model was unique and grew out of a certain time in history, and, as we have said, it was not to be repeated. A space program needs presidential support, political will, and congressional support in the form of adequate funding. If one or more is missing, the effort is doomed.

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<sup>248</sup> McCurdy, *Space Station Decision*, 227.

After *Apollo*, NASA would have to develop a compelling rationale for any new program. Because the decision would be made by a politician, the rationale had to be political in nature. Kennedy's decision was political, as was Nixon's. With the rationale solidly in place, NASA would need to find a champion; if not the President, then it had to be someone who had the President's ear. The state of the economy and of public opinion of the time must also be aligned with NASA's intentions. To mount an ambitious program like *Apollo*, the public needs a compelling reason to spend the high levels of taxpayer money to justify the decision. And, as *Apollo* proved, public opinion and congressional support can change very quickly. Space projects are expensive and lengthy, while the public's attention and congressional priorities are short and fickle. As a result of all of these realities, there has not been another decision like the authorization for *Apollo* since then.

Another long-term effect that *Apollo* had on NASA was that its greatest achievement to date came relatively near the beginning of the agency. After the successes of *Mercury* and *Gemini*, followed by the sublime achievements of *Apollo*, all coming in quick succession and creating an upward trajectory, there was no way for NASA to top the public spectacle without spending even more money—which could not happen during the recession-plagued 1970s.

Economics and changing public priorities, combined with a lack of political support, would combine to shrink NASA's budget markedly. Any program following *Apollo*, short of going to Mars, would be seen as a decline. Bigger and bigger spectacles are needed when relying on the fickle public's support. As

Kay points out, space histories and stories are written by space enthusiasts, who see Apollo as NASA's apex and everything that followed as a decline—without considering that it was Apollo that was the exception, and not the rule.<sup>249</sup>

Eisenhower was correct in recommending a space program that grew modestly, organically, and sustainably. After *Apollo*, the Eisenhower model is what the US space program returned to, but not without a difficult, but necessary, change of attitude at NASA.

While *Apollo* was a short term boon for NASA and the US, it ultimately hurt NASA in the long term by setting unrealistic expectations within NASA and with the public, expectations that could never be met.

### Evaluation of Shuttle

There is no question that the space shuttle is an astounding technological achievement and a beautiful and elegant spacecraft, a true triumph of engineering. This is especially true when one considers the amount of design compromise that was necessary to get the shuttle built at all. The shuttle that flew for thirty years was not the one that NASA had either envisioned or desired. It is a minimalist version of what NASA wanted, but it was still wondrous. One need only stand next to an *Apollo* capsule at the Udvar-Hazy Air & Space

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<sup>249</sup> Kay, *Defining NASA*, 100.

Museum, keeping in mind that *Apollo* was built with a colossal budget, and then stand next to the *Discovery* orbiter, which was developed on a more limited budget. It is nearly inconceivable that something as large and complex as *Discovery* ever made it into space, and did so over 130 times.

Was the shuttle a success? As we did with *Apollo*, we must first evaluate the shuttle by comparing it to the terms of the shuttle's original mandate. The space shuttle was designed to be reusable, economical, utilitarian, and to make access to space routine. To fairly evaluate the shuttle's success, we must consider each of these design goals. The shuttle was certainly reusable to a degree. Each orbiter was designed to be used over 100 times, or for ten years of planned flights, but one orbiter was used for 39 flights, and the others fewer, and they were used for 30 years. Each orbiter required much more maintenance between flights than forecast, and the maintenance was more expensive than had been planned. The stresses affecting the shuttle during liftoff and reentry were far more severe than had been anticipated. The external tanks had to be replaced with each flight, but the solid boosters were recovered from the ocean and reused. NASA had originally planned a fully reusable shuttle with a fly-back piloted first stage, which was estimated to cost \$15 billion to develop, but dropped this idea when only \$5.5 billion was allocated for development. The final configuration was mandatory if a shuttle was to be built at all. So the shuttle system was partially reusable.

The shuttle, largely sold on the basis of being a more economical system than the expendable system NASA had used in the 1960s, never achieved the

promise of \$100 a pound, or even \$1,000 a pound, to LEO that was predicted. In fact, it is estimated that the shuttle made access to orbit exponentially more expensive than any other launch system. In addition to the development costs, the recurring costs of flights were grossly underestimated—the original \$10 million estimated cost per flight quickly rose to \$57 million, and then ballooned to \$225 million per flight. By 1992, NASA was estimating the recurring cost per flight at a staggering \$412 million each, and the program finished at about \$450 million per flight. Designed to decrease costs drastically, it instead raised them even more dramatically, which would soak up much of NASA's budget for the next thirty years.

The shuttle was designed for utility, and it was fairly utilitarian. It could carry space station modules and laboratories, launch and retrieve satellites, ferry crew to and from the ISS, and stay in orbit for up to two weeks. It was able to launch very large payloads, like Key Hole reconnaissance satellites and the Hubble Space Telescope, and it was able to service the Hubble several times. It carried NASA, DoD, and commercial satellites until the *Challenger* accident and investigation, which determined that the shuttle was more risky than had been believed, and that only NASA and DoD satellites should be carried. As all of the US launch service eggs had been placed into the shuttle basket and the ELVs had been discontinued, for the several years that the shuttle program was grounded, European consortium Arianespace became the prime launch vendor for commercial satellites in the world. The US launch industry was effectively

killed off, although it may finally be recovering with the emergence of private commercial space vendors like SpaceX and Orbital Sciences.

The *Challenger* accident review board found that management pressure to maintain an ambitious launch schedule in order to drive costs down by economies of scale, as had been promised by NASA in the early 1970s, was a contributing factor in the accident. As a result, the launch schedules were relaxed and became much more realistic.

The shuttle was supposed to make spaceflight routine. This it did not do. The planned 50+ launches per year to achieve cost savings never even reached higher than 9, and that was before the *Challenger* accident in 1986, while scheduling pressures were still in play. The spaceflight “industry” never became an industry like the airline industry, which had been NASA’s vision—shuttle flights never really made it past the experimental stage. Pre-*Challenger* accident, NASA had begun to engage in political and publicity stunts, sending Senator Jake Garn and Congressman Bill Nelson, both from NASA-heavy constituencies, on shuttle flights, but this tactic backfired badly when Teacher-in-Space Christa McAuliffe was killed in the *Challenger* accident. Despite the fact that the shuttle flew over 130 times, its flights never became routine.

When measured against its original objectives, the shuttle fails badly. On the positive side, it kept US crews in space for 30 years. On the negative side, the extremely high costs of operation precluded spending on other NASA priorities, such as planetary exploration and the development of a follow-on crewed space

system. The planned *Constellation* system never received the funding it needed to be developed on the required schedule and it was cancelled, leaving the US with no immediate follow-on to the shuttle and the US reliant on the Russian Space Agency for rides to the ISS. This situation is likely to change in several years, when SpaceX, Boeing, and Sierra Nevada begin private, crewed service to the ISS, barring delays or cancellations.

The Columbia Accident Investigation Board, convened after the loss of the *Columbia* in 2003, summarizes the shortcomings of the larger shuttle program. It was not a failure necessarily of design, although that was part of the issue. The Board found that the issue with the shuttle was a failure of the original concept and objectives:

It is the Board's view that, in retrospect, the increased complexity of a Shuttle designed to be all things to all people created inherently greater risks than if more realistic technical goals had been set at the start. Designing a reusable spacecraft that is also cost-effective is a daunting engineering challenge; doing so on a tightly constrained budget is even more difficult. Nevertheless, the remarkable system we have today is a reflection of the tremendous engineering expertise and dedication of the workforce that designed and built the Space Shuttle within the constraints it was given.

In the end, the greatest compromise NASA made was not so much with any particular element of the technical design, but rather with the premise

of the vehicle itself. NASA promised it could develop a Shuttle that would be launched almost on demand and would fly many missions each year. Throughout the history of the program, a gap has persisted between the rhetoric NASA has used to market the Space Shuttle and operational reality, leading to an enduring image of the Shuttle as capable of safely and routinely carrying out missions with little risk.<sup>250</sup>

W.D. Kay explains how the shuttle program is representative of NASA in the early 1970s, and that the shuttle was “very much a product of its time. Viewed in its larger political and historical context, it is a near-perfect example of a technology designed by an agency with no clear mission: the means for implementing an undefined policy.”<sup>251</sup> This all falls at the feet of Richard Nixon, who was responsible for both the policy and the program.

### Long-Term Effects of the Shuttle

The shuttle program, while keeping NASA in human spaceflight for 30 years, was ultimately a net negative for the agency and for spaceflight in general. One of the failures was the budgetary drain on NASA due to the exceedingly high costs of operation for the shuttle program, while the overall NASA budget was either

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<sup>250</sup> Columbia Accident Investigation Board, *Report*, 23.

<sup>251</sup> Kay, *Defining NASA*, 112.

flat or being gradually reduced. As stated above, the cost of the ongoing shuttle operations left little for developing its replacement.

Another failure is one of popular imagination. The shuttle sought to make spaceflight routine, but instead made it mundane. Launches were not considered newsworthy unless there was trouble or drama associated with them, such as when John Glenn returned to space as a septuagenarian. In a consumer society, new products and newness keep the interest of the buying public--this is true of the US space program as well. The early space program was the model of cutting-edge innovation, and new boosters and spacecraft were introduced every few years. This all came to a halt with the shuttle program, where the same 1970s technology became the face of NASA for 30 years. Shuttle technology eventually became stale and hard to sell to a bored public, which had gravitated to reality television, celebrity news, and professional sports.

It wasn't just the public's interest in NASA that suffered. Scientific achievement also suffered as a result the shuttle program. "[After the *Challenger* accident,] Big Science lost its luster. Congress cancelled the Superconducting Super Collider and nearly abolished the *International Space Station (ISS)*. NASA's continuing travails with the remaining space shuttles clearly revealed that the transport vehicle had failed to meet its original cost, schedule, and reliability goals."<sup>252</sup> Children no longer dreamed of being astronauts, engineers, or scientists. They were no longer inspired by NASA, which had become uninspiring.

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<sup>252</sup> McCurdy, *Imagination*, 117.

After the second space shuttle accident and national tragedy in less than twenty years, even NASA began to understand. In 2005, NASA administrator Mike Griffin told the *USA Today* editorial board that the decision to build the space shuttle “was not the right path,” and that “[w]e are now trying to change the path while doing as little damage as we can.” He also testified to Congress that the shuttle was “inherently flawed.”<sup>253</sup> Griffin admitted NASA’s failures, and then placed NASA on the pathway to the future. His advocacy of leveraging the forces of private commercialization in some space activities just may be the way to a better NASA, as we will see below.

### Lessons Learned

The main lesson we can take away from this study is the vital need for all of the following to achieve a successful government space program: consistent political will across administrations; a high level of funding over the lifespan of the project; and a compellingly articulated rationale for the space program. All of these requirements were understood by perhaps the best NASA administrator, James Webb, who articulated them to Lyndon Johnson during the *Apollo* debate: “There’s got to be political support over a long period of time, like ten years, and you [Johnson] and the President have to recognize that we can’t do this type of

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<sup>253</sup> Watson, “NASA administrator.”

thing without that continuing support.”<sup>254</sup> As we have seen, other factors can come into play, such as changes in the economy, the nature of science and engineering development, and international affairs. These factors all had lasting effects on *Apollo*, the shuttle, and on NASA itself. Unforeseen events like accidents can influence a space program—with the *Apollo 1*, *Challenger*, and *Columbia* accidents, NASA was grounded and had to retrench for approximately two years each time. Unfortunately, these accidents are part of the learning process and eventually contribute to future safety. But they can also influence public support for the space program. In the cases of the *Apollo 1* and *Challenger* accidents, public support for the space program grew. But after the *Columbia* accident, NASA began to plan for a post-shuttle future.

A program cannot be formulated as a reaction to circumstances, because when the circumstances change, the rationale for the expenditures is lost; this happened to *Apollo*. The exception to this rule would be a program to address a threat to humanity, such as a potential NEO strike, which would almost certainly guarantee public support of an *Apollo*-type program. Another type of circumstance that might prompt such a reaction from the public would be a paradigm-shifting event, such as the discovery of extraterrestrial life or, more dramatically, contact with intelligent extraterrestrial life. Short of this type of event, it is hard to imagine the public advocating a large-scale space endeavor like a trip to Mars, unless the spending is spread out incrementally over a period of time and involves international cooperation and shared funding. An incident

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<sup>254</sup> Lambright, *Powering Apollo*, 96.

that might spark another space race would be a Chinese moon landing—the US sees the Chinese as the new competition rather than the former Soviet Union, so an event like a moon landing has a chance to spark a new space race. But a new race in response to Chinese technological achievement is rendered less likely by the fact that the Chinese are not currently a military threat as much as an economic threat to the US.

What the shuttle decision teaches us is that it is folly to build a space system either as a compromise or on the cheap. If we are to place men and women in space vehicles, it should not be in a vehicle that is “good enough,” but rather, the vehicle should be the best that can be designed and produced. Space travel is difficult and dangerous, and will remain so into the future; and even if space travel becomes much less costly, it will still be dangerous because of the unforgivingly hostile environment of space. If a system fails, the crew will die. The forces of nature will not change as our space systems become more economical.

We should heed the advice of Dwight Eisenhower and maintain a steady, organic space program. The pace should be natural and should be such that it could remain funded through the vagaries of economic cycles and changing political climates. We cannot race, nor can we stagnate. Eisenhower and Webb were right—we need a space program that is balanced and affordable.

## The Way Forward

When the 30-year old US Space Shuttle program ended in 2011, America was again left without the means to ferry crews to LEO. A similar situation has happened three times since NASA started sending humans into space: from 1963 to 1965, during the period between *Projects Mercury* and *Gemini*; from 1966 to 1968 during the period between *Projects Gemini* and *Apollo* (extended by the *Apollo 1* tragedy and its aftermath); and from 1975 to 1981, during the period after the *Apollo-Soyuz Test Project* and before the inaugural flight of *Columbia*. In each case, NASA was developing the next-generation spacecraft during the interim, and it was assured that the American human spaceflight program would again proceed after the temporary disruptions. However, after the last flight of *Atlantis* took place, the future of America's crewed space program became less than certain.

History tells us that the failure of strong presidential leadership on the issue of human spaceflight will likely result in confusion and false starts. Several presidents have attempted to jump-start post-Apollo NASA by introducing space policies and making nationally-televised policy speeches, but without sufficient funding and follow up support, the attempts were destined for failure. Realistic deadlines must be set and met, and sufficient funding must be provided by a supportive Congress.

President Bush's Vision for Space Exploration (VSE), first proposed in early 2004, promised trips back to the Moon and on to Mars and featured as its

centerpiece the *Constellation Program*. But this program has fallen victim to poor planning and inaccurate cost estimating, a lack of political will and support, and flat budgets; the funding that had been allocated was largely consumed by the prohibitively expensive *STS* program. The *Constellation Program*, composed of the *Ares* launchers, the *Orion* crew capsule, and the *Altair* lunar lander, and originally expected to begin service to the *ISS* early in this decade, has been cancelled by the Obama administration following the recommendations of the Augustine Commission. Although its decisions were non-binding, the Augustine Report stated that *Constellation Program* was negatively impacted by inadequate funding, massive cost overruns, schedule delays (the report estimated that *Constellation* could not be ready before 2017), and seemingly intractable design and technical issues.

Without a new vehicle in the works but with an immediate need for crew and cargo service to the *ISS*, America has turned to the international community for assistance. NASA contracted with the Russian Federal Space Agency (Roscosmos) to provide crew transport services to the *ISS* on the venerable *Soyuz*, and is working with Roscosmos, the European Space Agency (ESA), and Japan Aerospace Exploration Agency (JAXA) on automated cargo flights for resupply services to the *ISS*. NASA has studied the possibility of human-rating the Enhanced Expendable Launch Vehicles (EELV) such as the Delta IV Heavy and Atlas 5. These changes underline the obvious point that NASA needed to move in a new direction if it was to maintain its leadership in human space flight.

During the past decade NASA has done just that by positioning itself to support, leverage, and eventually rely on, private companies for access to LEO.

The VSE program called for the end of the shuttle flights by 2010, exacerbating the need for supply missions to the *ISS*. When NASA administrator Mike Griffin admitted that the shuttle was a mistake, he sought to provide a more economical solution. Rather than looking to cut corners or to compromise, he decided that an entirely new approach was necessary: to change the way NASA deals with contractors and to rely more on market forces to contain development and operational costs. Griffin determined that the cargo resupply capabilities of Roscosmos, ESA, and JAXA would be insufficient to keep the station adequately provisioned, and that there would be a gap of at least four years between the end of shuttle service and the start of *Constellation* service; Griffin and NASA therefore turned to private industry to develop commercial solutions to bridge this gap. In 2005, Griffin created the Commercial Crew and Cargo Program (C3PO) to fulfill three objectives: implement US Space Exploration policy with investments to stimulate the commercial space industry; facilitate US private industry cargo and crew space transportation capabilities with the goal of achieving reliable, cost-effective access to LEO; and create a market environment in which commercial space transportation services are available to government and private sector customers.

The C3PO has developed several novel programs that work with commercial companies in a partner capacity (rather than in the traditional NASA-style government/contractor relationship). These programs include the Commercial

Orbital Transportation Services (COTS), the Commercial Crew Development (CCDev) and the Commercial Resupply Service (CRS) programs, which are transforming the way NASA does business. These programs, which partner with private space ventures to provide cargo service to the *ISS* and will someday soon carry US crews to the *ISS*, are not based on the traditional “cost plus” financial model as old as the Space Age itself. Instead, these programs bring market forces to bear on the space industry by using Space Act Agreements under the "other transactions" authority in the National Aeronautics and Space Act when contracting with vendors. These agreements are milestone-driven, performance-based contracts that only release funds to the contracts when pre-defined milestones are successfully met. In a revolutionary new twist, at certain points in the timetable the companies under contract, such as SpaceX and Orbital Science in the case of the COTS program, are required to provide some of their own investment funds to match NASA's. This structure requires the companies under contract to remain viable and, therefore, attractive to private and institutional investors, from whom they raise the equity they need to bring to the table with NASA. In this way, NASA, now itself an investor in space technology, is able to ensure that the companies under contract are sound, viable, and are being run in such a way as to appear to be a good business risk, regardless of the potential value of their technology.

Recent history has seen NASA wrestle with an identity crisis. Should NASA be a development or a mission agency? Should it continue to operate in the traditional cost plus/prime contractor aerospace mode, or should it become

leaner, leveraging the forces of privatization to bring the costs of travelling into space down and increase reliability? The accident review conducted after the 2003 *Columbia* accident recommended that the shuttle program be terminated by 2010, but the supporting *Constellation* program that was championed by the VSE program became a multi-billion dollar boondoggle that was over-budget, late, and underperforming. The only certainty at NASA was that funding would remain flat at best, and most likely be reduced in the face of a prolonged and deep economic recession, with the US seeming to teeter on the verge of bankruptcy.

In May of 2009, the Obama administration's Office of Science and Technology Policy announced that a review of NASA's Human Space Flight (HSF) plans would be undertaken by the newly formed Review of United States Human Space Flight Plans Committee. The Augustine Committee, as it has come to be known, was composed of 10 space experts, astronauts, professors, and aerospace executives, and headed by Norman Augustine, former CEO of Lockheed Martin. The Committee's findings were intended to inform and shape the Obama administration's space policy in the post-Shuttle era. In a widely covered media event, the Committee's 157-page final report was released on October 22, 2009. Public reception of the report was mixed. The House Science and Technology Committee excoriated it.<sup>255</sup> Many NASA-philes lamented the recommended death of the *Constellation* program. Some thought the panel was

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<sup>255</sup> Dinerman, "NASA's next step."

misguided, focusing on means rather than ends.<sup>256</sup> The Committee fulfilled its charge to take a hard look at the current NASA human spaceflight trajectory, reconcile it with budgetary and timeline realities, and provide options for moving forward with human spaceflight. On the whole, this Presidential Review deserves a lot of credence because its findings are based on sound science and a clear-eyed look at the realities.

The Augustine Commission Report discussed two options for transporting crews into LEO: government-operated systems and private, commercial systems. Due to budget and scheduling conflicts, *Ares I* would not have been ready to support the *ISS* when the shuttle was retired, as had been planned. The Report recommended that the capability to launch humans into LEO be provided by private industry, as Mike Griffin had suggested and NASA had been pursuing; the return from the complex and reusable shuttle back to simpler and smaller capsules is seen as an opportunity to turn this capability over to the US private sector. Although this approach does have risks, it could reduce the operating costs due to the introduction of market forces. It would also accelerate the timeline for providing a US-based system of putting humans into LEO and servicing the *ISS*. Such a system could be achieved through government-awarded, guaranteed contracts to private firms, thereby stimulating the commercial space industry, driving up the number of commercial launches, and driving down operating costs for NASA and others in need of launch services.

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<sup>256</sup> Spudis, "Augustine Commission."

By outsourcing the launch services to a third party, NASA could focus on its core competencies, such as research and development, designing and operating exploration systems (especially beyond LEO), and program management. The Committee went on to say, in the strongest possible language, that it was time for NASA to resume its “crucial role in developing new technologies for space.” The available alternatives for space exploration are limited due to NASA’s lack of strategic investment in space technology development over the past thirty years. They further stated that it is crucial for NASA to develop a technology path that would serve their future goals of exploration. With appropriate funding, the Committee felt this new focus could serve to reenergize the thinking at universities, in industry, and within NASA itself, and should be done with the dual goals of developing new capabilities and reducing development and operating costs.

Current NASA structure is ideal for Cold War-era Apollo-style projects,<sup>257</sup> but is insufficient for current needs, and the Augustine Commission Report made recommendations for improving the structure and operational aspects of NASA to better suit it for its future mission of exploration. For example, they recommend that the NASA administrator have the proper authority to effectively manage the organization’s resources, including funds, personnel, and facilities. Additional funding should be provided to cover unanticipated overages or delays. Funds should be transferable from one project to another when needed. Requests for

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<sup>257</sup> Sabathier, “Commentary,” 2.

additional funding should be addressed more quickly than the current two years. The Augustine report makes it clear that the NASA organization must become flexible, responsive, and resilient if it is to move forward successfully, and that to facilitate this success, government support for NASA should be steady, constant, and reliable.

Whether the cancellation of *Constellation* for a privatized LEO capability is the appropriate strategy remains to be seen. What is clear, however, is that *Constellation* was underfunded and behind schedule, and the clock on the shuttle and *ISS* programs was ticking. The actions and funding allocations necessary to deliver *Orion* and *Ares I* by 2012 needed to have been made years ago, but were neglected; that failure constitutes the political reality that the Augustine Committee confronted when it examined NASA's plans for human spaceflight. The Committee fulfilled its charter and made the difficult, unpopular, but necessary choices in determining the best way for NASA move safely and surely into the future.

The Augustine recommendations were not binding, but the Obama administration adopted many of the suggestions in its new Space Policy in 2010. The Space Policy is also non-binding, as Congress determines the direction of the US space program. However, the recommendations for leveraging private space companies to deliver crew and cargo to LEO rather than relying on the *Constellation* program or on international vendors continues the trajectory started by Mike Griffin towards the privatization of launch services that NASA can purchase rather than develop.

It is certain that Congress cannot easily decide what to do with NASA. For every advocate who believes in privatizing cargo and crew missions into LEO, another Representative or Senator continues to fight for "big space," the traditional method of space procurement, if only to protect their constituencies, many of whom relied on the shuttle and Constellation programs for employment. To replace the lost *Constellation* program, Congress has authorized the *Space Launch System* (a heavy lift system that may or may not ever be built), or *SLS*, and a modified *Orion* capsule, which will be used for future NASA missions beyond LEO.

How the current situation will play out is still unknown. NASA is changing how they do business in an attempt to do more with smaller budgets. But the nature of the privatized commercial launch business is such that one accident or dramatic failure, especially one involving loss of life, can kill a company or even arrest the broader move toward privatized spaceflight. Putting crew and cargo into orbit is an extraordinarily difficult and dangerous task fraught with roadblocks and fickle politicians, and is always dogged by the ever-present and immutable laws of physics.

If companies like SpaceX are successful in their efforts, maintain their relationships with NASA, remain profitable, and, most importantly, deliver on their contractual obligations, they are positioned to become the means by which American astronauts travel into LEO for years to come. If SpaceX's Falcon Heavy is successful and lives up to its early marketing claims of delivering 53 tons into LEO for about \$100 million dollars a flight, it will almost certainly change

the dynamics of a world launch market that is presently dominated by the ESA and Russia, and may just recapture the US share of world launches that was lost after the *Challenger* accident. Another factor that hinders the US share of the launch market besides cost is the restrictive International Traffic in Arms Regulations (ITAR) regime, which deserves revisiting and perhaps an overhaul.

The success of private launch services, of course, is merely speculative at this point. The spaceflight community has long been fueled by unrealistic expectations and fantasies. Oftentimes, it is difficult to separate fact from fond wish. However, if at all possible, SpaceX has shown positive signs that it can work with NASA in a partnership to develop an American launch system that may eventually drive down costs and safely deliver crews to the *ISS*, and could even usher in the next phase of spaceflight: private space access. SpaceX recently successfully delivered cargo to the *ISS* and is now contracted to do so moving forward, as is Orbital Sciences. SpaceX's success to date has been based in reality, not on PowerPoint presentations and puffery.

The way forward should involve private spaceflight services for crew and cargo to LEO. Prices for these services can be negotiated, and the necessary funds set aside by Congress and NASA for each scheduled flight. NASA should be involved in space research and beyond-LEO space missions. The projects that they undertake should be well-defined, and money should be put away incrementally in advance of the missions, so that the funds can draw interest and be available when needed, in an effort to mitigate the effects of cyclical budgets. The mission planning and fund sequestering activities must transcend

presidential terms and need to become national projects not subject to the whims of changing administrations. This would require a change made to the NASA Authorization Act that would take the budget and planning process out of the hands of politicians once the decisions have been made. NASA should continue its public outreach efforts—NASA should emphasize, however, how small the NASA budget really is to counter the public perception that it is huge. NASA TV should be reconceived and financially supported to make it accessible and appealing to the general public. The public will continue to determine whether NASA is treated as a priority or deemed a waste of taxpayer money, so public outreach should be seen as a vital effort of the agency.

There are no easy answers here, but it appears that NASA is finally on the right track with its recognition that the premise, and not so much the design, of the shuttle was to blame for its failures. The fact that human spaceflight is very expensive is due to the fact that getting into space is very difficult. The forces of nature and the physical principles will not change, so costs should be brought down through the application of market forces and not through design-impacting cost-saving measures. The deployment of market forces should not be done, however, by the government itself, as was discovered through the shuttle experience, but rather, through contracting with private companies in a manner that emphasizes efficiency and economies of scale. The impulse for economical space travel was correct, but the economy should come in the manufacturing and operations efficiencies, not in cutting corners on the design or in creating a one-size-fits-all system.

The US should have a separate system, built by private industry, to ferry crews into LEO, which is a largely known quantity at this point. A second system should be used for the more exploratory purposes, like the *SLS/Orion* system. Large scale projects should be avoided, or if they are necessary, should be planned well in advance so the costs could be amortized over time to minimize the effects of political fickleness and changing budgets. Funding a future Mars mission would be a great start—the funds could begin to be allocated for the journey twenty or thirty years in advance, perhaps even through selling bonds or crowdsourcing, and a portion should be allocated for the mission, in addition to the R & D funds. Compound interest could be a powerful way to increase future NASA budgets.

NASA itself also needs a good reorganization and culture change. The employees are likely the right ones, but bureaucratic inertia and territoriality constitute a real drag on the management side. The organization should become leaner and more aggressive, and it must move out of the bureaucratic mode. If a few changes could be made, it could do more with less, as American business has had to do over the last two decades. The money saved from overhead and bureaucracy could be spent on research or banked for the future.

NASA's future is bright, and I believe that it is finally on the correct path. Mike Griffin's changes are starting to bear fruit, and the Augustine Commission has made some excellent recommendations that should be followed. NASA was able to capture the imagination of a large portion of the public with the excellent outreach efforts it made surrounding the Mars Science Laboratory landing

several months ago—the agency is beginning to understand the nature of the new online culture and to deploy social media to garner support. I am very optimistic that NASA’s best days are still ahead. I hope someday to read of a person who, as a 10-year old, was inspired by what NASA was doing in 2012 and stands on the surface of Mars.

Both Kennedy and Nixon were right—space *is* a frontier to be conquered, and America *does* need heroes. NASA is an organization that, with the help of American industry and ingenuity, can enable those heroes to conquer that frontier far into the future. While the mythology of *Apollo* makes for good marketing, NASA cannot count on that type of support and must remain clear-eyed and tenacious moving into the future. NASA’s charge moving forward should be, borrowing a quote from Alfred, Lord Tennyson: *to strive, to seek, to find, and not to yield.*

## BIBLIOGRAPHY

- Allday, Jonathan. *Apollo in Perspective: Spaceflight Then and Now*. Bristol, UK: Institute of Physics Pub., 2000.
- Allison, Graham T, and Philip Zelikow. *Essence of Decision: Explaining the Cuban Missile Crisis*. 2nd ed. New York: Longman, 1999.
- Balogh, André. 2009. "ABOVE AND BEYOND." *History Today* 59, no. 7: 14-20.
- Barry, William P., Louis Friedman, James E. Oberg, and Howard E. McCurdy. 2011. "Helpful lessons from the space race." *Issues In Science & Technology* 27, no. 4: 19-22.
- Benjamin, Marina. *Rocket Dreams: How the Space Age Shaped Our Vision of a World Beyond*. New York: Free Press, 2003.
- Berman, Bob. 2009. "Major mess-ups ... maybe." *Astronomy* 37, no. 4: 16.
- Bizony, Piers. 1994. "Politics of Apollo." *Omni* 16, no. 10: 44.
- Bizony, Piers. 2009. "The great uncertainty of Apollo." *Engineering & Technology* (17509637) 4, no. 12: 20-23.
- Bizony, Piers. *The Man Who Ran the Moon: James E. Webb and the Secret History of Project Apollo*. New York: Thunder's Mouth Press, 2006.
- Brooks, Courtney G., James M. Grimwood, and Loyd S. Swenson, Jr. *Chariots for Apollo: A History of Manned Lunar Spacecraft*. Washington, DC: NASA SP-4205, 1979.

- Bulkeley, Rip. *The Sputniks Crisis and Early United States Space Policy: A Critique of the Historiography of Space*. Bloomington: Indiana University Press, 1991
- Burgess, Colin, ed. *Footprints in the Dust, 1969-1972*. Lincoln: University of Nebraska Press, 2010.
- Burrows, William E. *This New Ocean: the Story of the First Space Age*. New York: Random House, 1998.
- Byerly Jr., Radford. 1990. "Not Where, But How Do We Go From Here?." *Ad Astra* 2, no. 1: 3.
- Chaikin, Andrew. *A Man on the Moon: the Voyages of the Apollo Astronauts*. New York, N.Y.: Penguin Books, 2007.
- Covault, Craig. 2007. "Blame It On Nixon." *Aviation Week & Space Technology* 166, no. 12: 136.
- Cross, Michael. 1993. "The Kennedy imperative." *New Scientist* 140, no. 1904: 26.
- Davis, Sid. Recorded interview by Vicki Daitch, February 10, 2003, (15-16), John F. Kennedy Library Oral History Program.
- Democratic Party Platform of 1960, July 11, 1960,  
<http://www.presidency.ucsb.edu/ws/index.php?pid=29602>
- Dicht, Burton. 2009. "'The most hazardous and dangerous and greatest adventure on which man has ever embarked.'" *Mechanical Engineering* 131, no. 7: 28-35.
- Dinerman, Taylor. "NASA's next step: Augustine (and Obama) versus Congress," [www.TheSpaceReview.com](http://www.TheSpaceReview.com), September 21, 2009.

- Durant, Frederick C., and John H Disher. *Between Sputnik and the Shuttle: New Perspectives On American Astronautics*. San Diego, Calif.: Published for American Astronautical Society by Univelt, 1981.
- Eisenhower, Dwight D. "Are We Headed in the Wrong Direction?" *Saturday Evening Post*, 11-18 August 1962, 24.
- Etzioni, Amitai. *The Moondoggle: Domestic and International Implications of the Space Race*. Garden City, NY: Doubleday, 1964.
- Fowler, Eugene. *One Small Step: Project Apollo and the Legacy of the Space Age*. New York: Smithmark, 1999.
- French, Francis, and Colin Burgess. *In the Shadow of the Moon: A Challenging Journey to Tranquility, 1965-1969*. Lincoln: University of Nebraska Press, 2007.
- French, Francis, and Colin Burgess. *Into That Silent Sea: Trailblazers of the Space Era, 1961-1965*. Lincoln: University of Nebraska Press, 2007.
- Fulghum, David A. 1999. "From idealism to despair to the moon." *Aviation Week & Space Technology* 151, no. 25: 116.
- Furniss, Tim. 'One Small Step'—*The Apollo Missions, the Astronauts, the Aftermath: A Twenty-Year Perspective*. Yeovil, UK: G. T. Foulis, 1989.
- Garber, Stephen J. 'Multiple Means to an End: A Reexamination of President Kennedy's Decision to Go to the Moon.' *Quest: The History of Spaceflight Quarterly* 7 (Summer 1999): 5–17.
- Goldman, Nathan C. *Space Policy: an Introduction*. Ames: Iowa State University Press, 1992.
- Grabois, Michael R. 2011. "Apollo: Learning from the past, for the future." *Acta Astronautica* 68, no. 7/8: 1353-1360.
- Greenewalt Committee Notes, September 23, 1959, NASA History Office.

- Griffin, Michael. 2011. "Operationally Fragile.'" *Aviation Week & Space Technology* 173, no. 26: 72.
- Guerrier, Steven W, and Wayne Thompson. *Space—National Programs and International Cooperation*. Boulder: Westview Press, 1989.
- Haney, Paul. 1998. "Spinning space in the cold war." *Harvard International Journal Of Press/Politics* 3, no. 3: 126.
- Hardesty, Von and Gene Eisman. *Epic Rivalry: The Inside Story of the Soviet and American Space Race*. Washington, DC: National geographic Society, 2007.
- Harvey, Brian. *Race into Space*. New York: Halsted Press, 1988.
- Heppenheimer, T. A. *Countdown: A History of Space Flight*. New York: John Wiley & Sons, 1997.
- Heppenheimer, T. A. *History of the Space Shuttle*. Washington, DC: Smithsonian Institution Press, 2002.
- Heppenheimer, T. A. *The Space Shuttle Decision: NASA's Search for a Reusable Space Vehicle*. Washington, DC: National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999.
- Hogan, Thor. *Mars Wars: the Rise and Fall of the Space Exploration Initiative*. Washington, DC: National Aeronautics and Space Administration, NASA History Division, Office of External Relations, 2007.
- Hurt, Harry. *For All Mankind*. New York: The Atlantic Monthly Press, 1988.
- Jastrow, Robert, and Homer E. Newell. 1972. "The Space Program and the national interest." *Foreign Affairs* 50, no. 3: 532-544.

- Jenkins, Dennis R. *Space Shuttle: the History of the National Space Transportation System: the First 100 Missions*. 3rd ed. Cape Canaveral, Fla.: D.R. Jenkins, 2001.
- Johnson, Lyndon B. "Memorandum for the President," April 28, 1961, in *Exploring the Unknown*, ed. Logsdon, et al., Vol. I, 427-429.
- Johnson, Lyndon B. *The Vantage Point: Perspectives on the Presidency, 1963–1969*. Austin, TX: Holt, Rinehart and Winston, 1971.
- Kauffman, James L. *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961–1963*. Tuscaloosa: University of Alabama Press, 1994.
- Kay, W. D. *Defining NASA: the Historical Debate over the Agency's Mission*. Albany: State University of New York Press, 2005.
- Kennedy, Donald. 2005. "NASA: Back to Eating Seed Corn." *Science*, November 25. 1245.
- Kennedy, John F. "Address at Rice University in Houston on the Nation's Space Effort," September 12, 1962. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.  
<http://www.presidency.ucsb.edu/ws/?pid=8862>.
- Kennedy, John F. "Address of Senator John F. Kennedy Accepting the Democratic Party Nomination for the Presidency of the United States - Memorial Coliseum, Los Angeles," July 15, 1960. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.  
<http://www.presidency.ucsb.edu/ws/?pid=25966>.
- Kennedy, John F. "Annual Message to the Congress on the State of the Union," January 30, 1961. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.  
<http://www.presidency.ucsb.edu/ws/?pid=8045>.

Kennedy, John F. "Inaugural Address," January 20, 1961. Online by Gerhard Peters and John T. Woolley, The American Presidency Project.

<http://www.presidency.ucsb.edu/ws/?pid=8032>.

Kennedy, John F. "Memorandum to the Vice President- Request for Evaluation of Space Program, April 20, 1961." Memorandum from the Papers of President Kennedy, President's Office Files, Box 30, Special Correspondence, "Johnson, Lyndon B. 1/56-11/61" folder.

[http://www.jfklibrary.org/Asset-Viewer/fz9Rxczs\\_UmFjbYk\\_Siy0Q.aspx](http://www.jfklibrary.org/Asset-Viewer/fz9Rxczs_UmFjbYk_Siy0Q.aspx)

Kennedy, John F. "Message to Chairman Khrushchev Concerning the Flight of the Soviet Astronaut," April 12, 1961. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.

<http://www.presidency.ucsb.edu/ws/?pid=8054>.

Kennedy, John F. "Press Conference," April 3, 1963. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.

<http://www.presidency.ucsb.edu/ws/?pid=9139>.

Kennedy, John F. "Press Conference," April 21, 1961, JFK Presidential Archives. Online at <http://www.jfklibrary.org/Research/Ready-Reference/Press-Conferences/News-Conference-10.aspx>

Kennedy, John F. "Remarks Following the Orbital Flight of Col. John H. Glenn, Jr.," February 20, 1962. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.

<http://www.presidency.ucsb.edu/ws/?pid=9067>.

Kennedy, John F. "Special Message to the Congress on Urgent National Needs," May 25, 1961. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.

<http://www.presidency.ucsb.edu/ws/?pid=8151>.

- Kennedy, John F. "Statement by the President on the Orbiting of a Soviet Astronaut.," April 12, 1961. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*.  
<http://www.presidency.ucsb.edu/ws/?pid=8053>.
- Klerkx, Greg. *Lost in Space: The Fall of NASA and the Dream of a New Space Age*. New York: Pantheon Press, 2004.
- Klesius, Michael. 2010. "The Evolution of Space Shuttle." *Air & Space Smithsonian* 25, no. 2: 58-61.
- Krug, Linda T. *Presidential Perspectives on Space Exploration: Guiding Metaphors From Eisenhower to Bush*. New York: Praeger, 1991.
- Lafleur, Jarret M., and Joseph H. Saleh. 2010. "Survey of mission evolution and flexibility in the Space Shuttle program." *Space Policy* 26, no. 4: 236-245.
- Lambright, W. Henry. *Powering Apollo: James E. Webb of NASA*. Baltimore: Johns Hopkins University Press, 1995.
- Lambright, W. Henry. *Space Policy in the Twenty-first Century*. Baltimore: Johns Hopkins University Press, 2003.
- Launius, Roger D, and Howard E McCurdy. *Presidential Leadership in the Development of the US Space Program*. Washington, DC: National Aeronautics and Space Administration , 1994.
- Launius, Roger D, and Howard E McCurdy. *Spaceflight and the Myth of Presidential Leadership*. Urbana: University of Illinois Press, 1997.
- Launius, Roger D, and J. D. Hunley. *An Annotated Bibliography of the Apollo Program*. Washington, DC: NASA History Office, NASA Headquarters , 1994.
- Launius, Roger D. *Apollo: a Retrospective Analysis*. Washington, DC: National Aeronautics and Space Administration , 1994.

- Launius, Roger D. *NASA: a History of the U.S. Civil Space Program*. Malabar, Fla.: Krieger Pub. Co., 1994.
- Launius, Roger D. "Assessing the legacy of the Space Shuttle." *Space Policy* 22, no. 4 (November 2006): 226-234.
- Launius, Roger D. 'Kennedy's Space Policy Reconsidered: A Post-Cold War Perspective.' *Air Power History* 50 (Winter 2003): 16–29.
- Launius, Roger D. 1994. "NASA and the decision to build the space shuttle, 1969-72." *Historian* 57, no. 1: 17.
- Launius, Roger D. 2001. "NASA Looks to the East: American Intelligence Estimates of Soviet Capabilities and Project Apollo." *Air Power History* 48, no. 3: 4.
- Launius, Roger D. 2003. "Public opinion polls and perceptions of US human spaceflight." *Space Policy* 19, no. 3: 163.
- Launius, Roger D. 2006. "Assessing the legacy of the Space Shuttle." *Space Policy* 22, no. 4: 226-234.
- Launius, Roger D. 2008. "Space stations for the United States: An idea whose time has come—and gone?." *Acta Astronautica* 62, no. 10/11: 539-555.
- Launius, Roger D. *Toward a History of the Space Shuttle: an Annotated Bibliography*. Washington, DC: NASA History Office , 1992.
- Launius, Roger. 2006. "Interpreting the Moon Landings: Project Apollo and the Historians." *History & Technology* 22, no. 3: 225-255.
- Leopold, George. 2011. "Space exploration is a marathon, not a sprint." *Electronic Engineering Times (01921541)* no. 1603: 50.
- Logsdon, John M. 1986. "The Space Shuttle Program: A Policy Failure?" *Science*, May 30. 232, no. 4754: 1099-1105. DOI: 10.1126/science.232.4754.1099

- Logsdon, John M. *John F. Kennedy and the Race to the Moon*. New York: Palgrave MacMillan, 2011.
- Logsdon, John M. *The Decision to Go to the Moon*. Cambridge: MIT Press, 1970.
- Logsdon, John M. 'National Decisions.' *Science* 173 (17 September 1971): 1079–80.
- Logsdon, John M. 2003. "A Sustainable Rationale for Human Spaceflight." *Issues In Science & Technology* 20, no. 2: 31-34.
- Logsdon, John M. 2011. "A new US approach to human spaceflight?." *Space Policy* 27, no. 1: 15-19.
- Logsdon, John M. 2011. "Analyzing the new Kennedy tape." *Space Policy* 27, no. 3: 153-156.
- Logsdon, John M. 2011. "Change and continuity in US space policy." *Space Policy* 27, no. 1: 1-2.
- Logsdon, John M. 2011. "Change and continuity in US space policy." *Space Policy* 27, no. 1: 1-2.
- Logsdon, John M. 2011. "John F. Kennedy's Space Legacy and Its Lessons for Today." *Issues In Science & Technology* 27, no. 3: 29-34.
- Logsdon, John M., and Alain Dupas. 1994. "Lessons to be learned from space station saga." *Aviation Week & Space Technology*, March 07. 52.
- Logsdon, John M., and Alain Dupas. 1994. "Was the race to the moon real?." *Scientific American* 270, no. 6: 36.
- Logsdon, John M., ed. *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume VII*. Washington, DC: US GPO, 2008.

- Logsdon, John M. *From Apollo to Shuttle: Policy Making in the Post-Apollo Era* (Unpublished MS).
- Low, George. Letter to John Logsdon, January 29, 1979. NASA History Office.
- Low, George. Memorandum. January 12, 1972. NASA History Office.
- Low, George. Memo for Record. November 15, 1971. NASA History Office.
- Low, George. Personal Notes. NASA Historical Office archives.
- Maher, Timothy. 2011. "One Small Misstep?." *Technology Review* 114, no. 3: 96.
- Mathematica Report—need citation
- McCurdy, Howard E. *The Space Station Decision: Incremental Politics and Technological Choice*. Baltimore: Johns Hopkins University Press, 1990.
- McCurdy, Howard. *Space and the American Imagination*. Baltimore: Johns Hopkins Press, 2011.
- McDougall, Walter A. 2010. "Shooting the Moon." *American Heritage* 59, no. 4: 88-90.
- McDougall, Walter. . . . *The Heavens and the Earth: A Political History of the Space Age*. Baltimore: Johns Hopkins Press, 1985.
- McQuaid, Kim. 2007. "Sputnik Reconsidered: Image and Reality in the Early Space Age." *Canadian Review Of American Studies* 37, no. 3: 371-401.
- Meigs, Jim, and Alyson Sheppard. 2011. "Was the Shuttle Worth It?." *Popular Mechanics* 188, no. 6: 56-58.
- Mindell, David A. *Digital Apollo: Human and Machine in Spaceflight*. Cambridge: MIT Press, 2008.
- Missiles and Rockets*, October 10, 1960, 12-13.

- Morring Jr., Frank. "Because It's Hard." *Aviation Week & Space Technology* 169, no. 12 (September 29, 2008): 56-62.
- Morring Jr., Frank. 2010. "'Almost an Afterthought'." *Aviation Week & Space Technology* 172, no. 44: 48.
- Morring Jr., Frank. 2010. "Harder Than It Looks." *Aviation Week & Space Technology* 172, no. 44: 52.
- Murray, Charles and Catherine Bly Cox. *Apollo*. Burkittsville, MD: South Mountain Books, 2004.
- Neufeld, Michael. *Von Braun: Dreamer of Space, Engineer of War*. New York: Alfred P. Knopf, 2007.
- Nixon, Richard M. "Inaugural Address," January 20, 1969. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=1941>.
- Nixon, Richard M. "Remarks on Arrival at Bucharest, Romania.," August 2, 1969. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=2172>.
- Nixon, Richard M. "Remarks to American Field Service Students," July 22, 1969. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=2134>.
- Nixon, Richard M. "Remarks to Apollo 11 Astronauts Aboard the U.S.S. Hornet Following Completion of Their Lunar Mission.," July 24, 1969. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=2138>
- Nixon, Richard M. "Statement About the Future of the United States Space Program," March 7, 1970. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=2903>.

- Nixon, Richard M. "Statement Announcing Decision To Proceed With Development of the Space Shuttle," January 5, 1972. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=3574>.
- Owen, David. 2003 "Diseased, demented, depressed: serious illness in Heads of State." *QJM* 96, no. 5: 325-336.
- Pelton, Joseph N. 2010. "The Space Shuttle—Evaluating an American icon." *Space Policy* 26, no. 4: 246-248.
- "Presidential Debate in New York," October 21, 1960. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. <http://www.presidency.ucsb.edu/ws/?pid=29403>.
- Pyne, Stephen J. 2009. "Finding Ourselves." *Chronicle Of Higher Education* 55, no. 42: B7-B9.
- Report of the Columbia Accident Investigation Board. 2003. NASA.
- Sabathier, Vincent G., *et al*, "Commentary on the Augustine Committee Report on the Future of Human Space Exploration," 2.
- Sadeh, Eligar. *Space Politics and Policy: an Evolutionary Perspective*. Dordrecht: Kluwer Academic Publishers, 2002.
- Salkever, Alex. 1999. "Following in the bootprints of a moon walk." *Christian Science Monitor*, July 20. 3.
- Schafer, James. *The Race: The Complete True Story of How America Beat Russia to the Moon*. New York: Anchor Books/Doubleday, 2000.
- Schlesinger, Arthur M., Jr. *A Thousand Days: John F. Kennedy in the White House*. Boston: Houghton Mifflin Harcourt, 2002.
- Schwartz, John. 2006. "NASA Official Questions Agency's Focus on the Shuttle." *New York Times*, December 09. 16.

- Seamans, Robert C. *Project Apollo: the Tough Decisions*. Washington DC: National Aeronautics and Space Administration, Office of External Relations, History Division, 2005.  
<http://purl.access.gpo.gov/GPO/LPS70417>.
- Semple, Robert B., Jr., "Nixon Executive Style Combines Desire for Order and Solitude," *New York Times*, January 12, 1970, p.1, 32.
- Shannon, John. 2011. "Was It Worth It?." *Aviation Week & Space Technology* 173, no. 26: 70.
- Shenhar, Aaron. 2011. "The Shuttle Era: Lasting Lessons." *Aviation Week & Space Technology* 173, no. 26: 90.
- Siddiqi, Asif A. *Challenge to Apollo: the Soviet Union and the Space Race, 1945-1974*. Washington, D.C.: National Aeronautics and Space Administration, NASA History Div., Office of Policy and Plans, 2000.
- Sidey, Hugh. 1994. "Why we went to the moon." *Time* 144, no. 4: 58.
- Sietzen Jr., Frank. 1999. "America and the Moon: Then & Now." *Ad Astra* 11, no. 4: 33.
- Sorensen, Theodore C. *Counselor: a life at the edge of history*. New York, NY: Harper Perennial, 2009.
- Sorensen, Theodore C. Recorded interview by Carl Kaysen, March 26, 1964, (1), John F. Kennedy Library Oral History Program.
- Space Task Group report, September 15, 1969.  
<http://www.hq.nasa.gov/office/pao/History/taskgrp.html>
- Spudis, Paul. "Augustine Commission and Space Exploration: Objectives Before Architectures - Strategies Before Tactics," [www.spaceref.com](http://www.spaceref.com), September 15, 2009.

- Temple III, L. Parker. 2005. "Committing to the Shuttle Without Ever Having a National Policy." *Air Power History* 52, no. 3: 36-51.
- Traci, Watson. 2005. "NASA administrator says space shuttle was a mistake." *USA Today*, September 28. 1a.
- Van Dyke, Vernon. *Pride and Power: The Rationale of the Space Program*. Urbana, IL: University of Illinois Press, 1964.
- Vedda, James A. 1996. "Evolution of executive branch space policy making." *Space Policy* 12, no. 3: 177.
- Von Bencke, Matthew J. *The Politics of Space: A History of US-Soviet/Russian Competition and Cooperation*. Boulder: Westview press, 1997.
- von Braun, Wernher. "Letter to Lyndon Johnson," April 29, 1961. Reprinted in Logsdon et al., eds., *Exploring the Unknown, Volume I*, 429-433.
- Watson, Traci. "NASA administrator says space shuttle was a mistake." *USA Today*. September 27, 2005.
- Webb, James, and McNamara, Robert. "Memorandum for the President," May 8, 1961, in *Exploring the Unknown*, ed. Logsdon, et al., Vol. I, 439-452.
- Weinberger, Caspar. Memorandum for the President August 12, 1971. NASA History Office.
- Whalen, David. *The Origins of Satellite Communications:1945-1965*. Washington, D.C.: Smithsonian Institution Press, 2002.
- Woods, Brian. 2009. "A political history of NASA's space shuttle: the development years, 1972-1982." *Sociological Review* 57, 25-46.