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Case study of the internal growth dynamics of NASA

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CASE STUDY OF THE INTERNAL GROWTH DYNAMICS OF NASA

By

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INTRODUCTION

Man's flight to the moon will undoubtedly rank in the annals of history as being one of the greatest technological achievements of this century. Never before has man taken such tremendous strides to break away from the earth's gravitational forces to explore space as he has done over the last decade. Certainly, future generations all over the world will look back upon this event and realize the impact it has had upon furthering United States preeminence in space. Nevertheless, despite the overall impact that the space program and the lunar landing have had on United States prestige among world powers, interest in space exploration has been rapidly declining. As a result, the civilian space program under the direction of the National Aeronautics and Space Administration (NASA) has been suffering from a massive slowdown since 1967.

As far back as 1968, space employment nationwide declined to 220,000 in 1968 from a peak of 420,000 the year before. This trend has continued up to the present, with workers being terminated daily in space centers all across the country. Even scientists and engineers, who have had years of training and experience in space technology, are now flocking to other jobs. NASA's budget has been cut

deeply from a high of 5.9 billion in 1966 to a present low of 3.7 billion, and most of that has been earmarked to clean up the Apollo Moon Project. In response to this devastating budget decrease in NASA's operations, important segments of the four billion dollar capital investment in plants and test centers by NASA are operating below capacity and are possibly threatened with closure. At present no large civilian projects, with the exception of "Skylab," a permanent orbital laboratory, are planned now that Americans have reached the moon. Consequently, NASA continues to lose public support as well as crucial appropriations from Congress.

Such a slowdown is highly unprecedented in NASA's history. In fact, NASA experienced unusually rapid growth up to 1966, when finally its unparalleled expansion began to wane. This rapid growth can easily be seen in Figure 1, which reviews NASA's increasing space budget from 1958 to 1966, and its decreasing budget thereafter. Projects such as the Mercury, Gemini, and Apollo programs were funded with little resistance from Congressmen. Space exploration and technology became the focal point of the American public as well as the aerospace industries, which became eager to secure large space contracts. Companies such as North American Aviation (now North American Rockwell), Boeing, Martin-Marrietta, McDonnell, and others which had normally dealt with defense contracts, could scarcely overlook

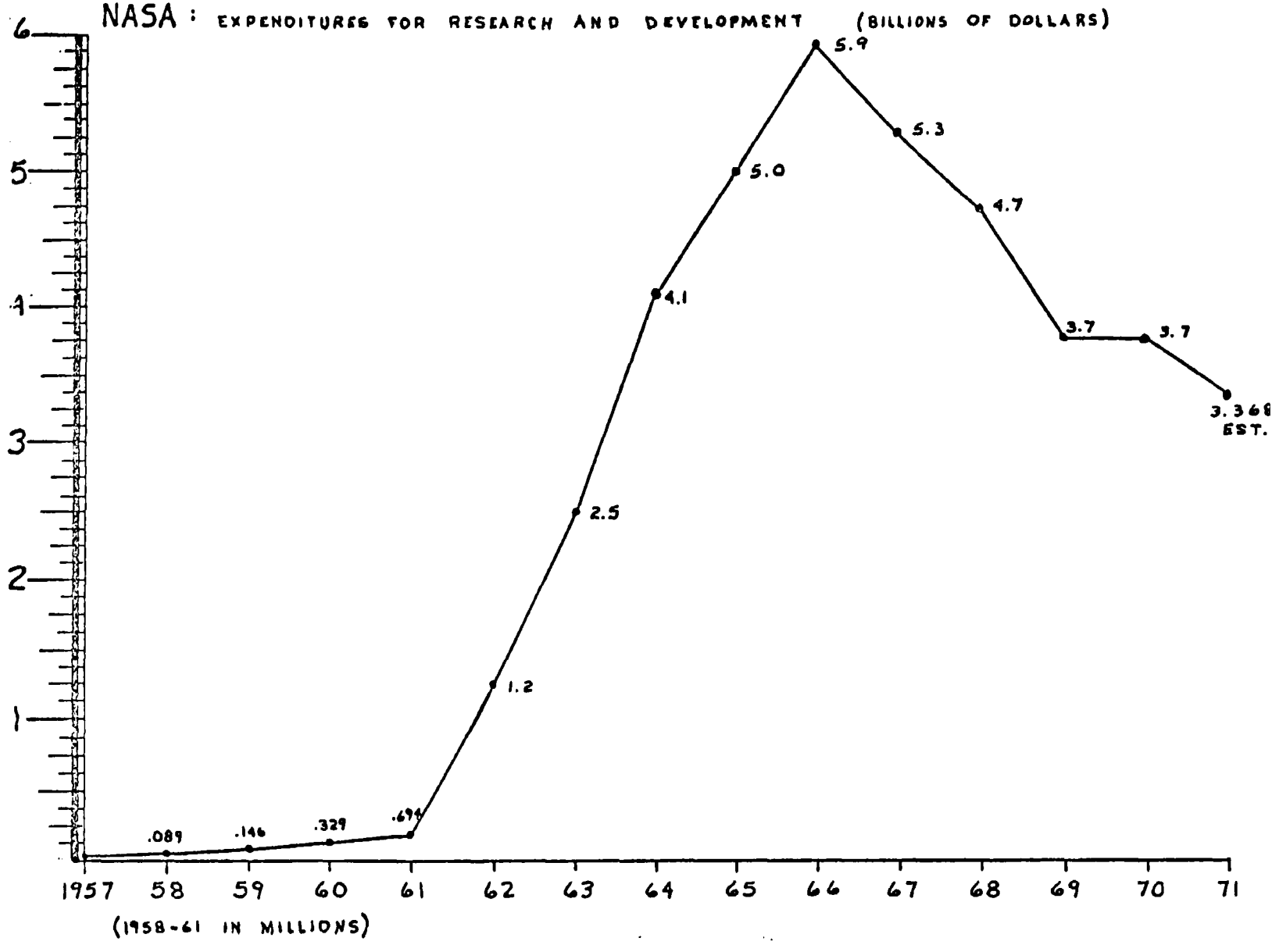

Figure 1. Expenditures for Research and Development

the pleasant public image offered by "peaceful" contracts that were associated with a trip to the moon, not to mention the enormous profits involved in the transactions. Thus did NASA experience overwhelming support from the President and Congress, the American public, and the space industry. With such strong external support, the civilian space agency faced little opposition from competing bureaus, e.g., the Defense Department, during the first part of the last decade.

Such rapid growth for a young agency is very unusual because most bureaus experience only gradual development until they are older and able to establish themselves. A young bureau's external sources of support are usually weak, or not accustomed to relations with the agency. Thus, the bureau must be able to demonstrate that its services are worthwhile to some group with influence over sufficient resources to keep it alive. Once the suppliers and beneficiaries of a bureau's services become convinced of their gains from it, and develop routinized relationships with it, the bureau can rely upon them for the support it needs. Eventually, the bureau's suppliers and beneficiaries become automatic support generators.

NASA, on the other hand, was unusual because it achieved this outside support from its suppliers and beneficiaries, i.e., the President and Congress, the American public, and the space industry, from the outset. These external forces in NASA's environment were convinced of the

gains from the space program and thus were able to develop routinized relationships with the space agency very rapidly. This situation automatically posed to the author several very important questions. Why were these external forces so convinced of the gains from the space program and, more importantly, why was NASA able to achieve such unusual accelerated growth during the first part of the last decade? Finally, why did NASA, after having experienced a period of rapid expansion, begin to decline or decelerate in growth in 1966?

It is the purpose of this thesis to provide some provisional answers to these questions in order to understand why NASA's development has deviated from most other patterns of bureaucratic growth. In this regard, the author has chosen to examine theoretical works on the concept of bureau development, and analytically compare NASA's growth patterns to these studies.

Anthony Downs, one of the leading authors in this field, has provided some interesting insights into the growth patterns of most bureaus. In his book, Inside Bureaucracy, Downs attributes an organization's growth, stability, and decline to a series of external developments, internal changes, or both, which occur during a bureau's struggle for autonomy.[1] He describes autonomy as the

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[1]Anthony Downs, Inside Bureaucracy (Boston: Little Brown & Co., 1967).

situation in which an agency has undisputed jurisdiction over a function, service, goal, issue, or cause. Autonomy, he feels, is crucial in achieving a bureau's "survival threshold," i.e., it is large enough to render useful services, and old enough to have established routinized relationships with its major clients.

Downs discusses a bureau's growth as generally being a constant struggle for survival since there is always the possibility that the bureau will be annihilated or absorbed by a much larger bureau. Stability is achieved when the bureau becomes older and has been able to establish relationships with its beneficiaries and suppliers. With this support a bureau can generally defend itself against competing elements in its environment. Decline may become prominent if social functions of the bureau do not remain important, or if those social functions are taken over by another bureau. Thus, Downs states that major changes in growth and decline of a bureau are often caused by exogenous, or external, forces in the bureau's environment. Certain environmental forces, he believes, affect a bureau's development more strongly than any purely internal changes, although the relationship between external and internal developments tends to have cumulative effects on growth or decline.

NASA's growth and decline, however, provide some intriguing deviations from Downs' description of bureau

development. Thus, the author will treat the study of NASA's growth dynamics as a special case of Downs' theory. The investigation will include a review of the relationships between the following variables related to NASA's development: international prestige; presidential ideology; and other organizations, e.g., the Defense Department (DOD) and the aerospace industry. In relation to this last variable the study will discuss the potential "predator-protector" relationship between DOD and the space industry. A discussion of these variables and their connection to NASA should provide some interesting insights into the reasons behind the space agency's unusual development since its creation in 1958.

The method of this study is to review the literature on the National Aeronautics and Space Administration (NASA) in regard to major changes which have occurred within the space agency from its creation to the present, with an emphasis on discovering their causes. My hypothesis, drawn from a theoretical formulation by Downs, is that changes in policy, function and internal structure are a consequence of environmental forces. This study, however, cannot "test" hypotheses in the conventional sense. What I propose to do is provide a documented case for the proposition that NASA's rapid growth and subsequent decline during the last decade was a function of large scale changes in external factors. In short, I will be using a simple stimulus-response

model of organizational change: I will be focusing on the relationship between changes in factors external and internal to NASA.

External factors are those variables which lie outside NASA and may or may not be contingent upon it. Changes in and among external factors, operating through certain organizational constants, produce concomitant variation in policy, function, and organizational structure. External variables include the behavior of other nations in the space field, notably the Soviet Union; the Congress and President; the American public; the space industry; and competing bureaucracies, such as the Department of Defense.

Internal variables are those which include major changes in function, policy, or structure of NASA. Examples of internal change are: changes in administration; formation of new goals; and changes in methods, such as manned space flight as opposed to automated methods of exploration. The latter problem of procedures has been of particular interest because of the rift in NASA between the scientists, who favor fully automated flights, and the engineers, who favor manned space flight.

Internal changes will be measured in the number and kind of personnel shifts occurring in NASA since its creation. Number and kind of changes in major policies may also be used as an operational indicator to describe the impact of external forces. Appropriations of NASA from year to

year should likewise give a good indication of the amount of support NASA has received from Congress, and thus will provide a clue as to when possible changes may have occurred in the space agency.

The author will try to account for major changes in external and internal variables by means of several theoretical propositions. The format of this thesis will consist of a chapter by chapter account of the variables pertaining to these theoretical propositions. The first four propositions will be discussed in Chapter 2 and related to the variables of international prestige and presidential ideology. The first proposition states that the more the programs of a bureau contribute to national prestige, the higher its status vis-a-vis other bureaus. In reference to this theoretical proposition, this study hopes to demonstrate that because NASA's policies were centered around obtaining national interests and international prestige, NASA was able to gain a higher status, or more recognition from the executive branch and Congress vis-a-vis other bureaus.

The first proposition is related to the second and third which state, respectively, that the higher the status of a bureau, the less it must compete for funds with other bureaus, and the less a bureau must compete for funds, the faster it grows. Thus, the study will attempt to demonstrate that because NASA more or less gained a favorable position with governmental officials during its early years of growth,

it did not have to compete greatly with allocational rivals for funds. As a result, it was able to achieve its rapid growth between 1958 and 1966.

The three foregoing propositions are linked with a fourth which states that perceptions of presidential roles may alter the speed with which a bureau grows, e.g., the more conservative the president, the greater the restraint on growth. In relation to this proposition the author hopes to demonstrate through documented events and policies that the philosophy of the president in office, e.g., Democratic or Republican, has had a definite impact upon NASA's overall growth pattern. Thus are each of these four theoretical propositions related to the important external variables of international prestige and presidential ideology.

In Chapter 3 I will investigate the role of competing bureaucracies--namely, the Defense Department, upon NASA's growth. The first of two propositions to be discussed states that during periods of growth, agencies reject expansion of functions, and during periods of decline, agencies resort to imperialism or logrolling in order to survive. The second asserts that in periods of decline, the more an agency logrolls, the better its capacity to defend its core interests against the bureaucratic imperialism of former rivals. Concerning these propositions, I hope to demonstrate that NASA maintained its functions and policies as a whole during its period of early rapid expansion but when its growth began to

ebb, the space agency began to shift goals in order to survive. Thus, this study will attempt to show that because NASA was forced to make major shifts in policy it was able to withstand impending pressures of its rivals.

The author will also try to show that because NASA had a large numberof competitors, e.g., the Army, Navy, and Air Force, during its early years of growth, its ability to survive was enhanced. This was due to the fact that the Army, Navy, and Air Force could not coalesce into a unified threat to NASA-- "the divide and conquer concept." This situation is in relation to the proposition that, the greater the number of competitors that seek to absorb the central goals of another agency, the lower the probability that the agency will be destroyed.

Chapter 4 will be devoted to an analysis of the aerospace industry as an important variable in the growth dynamics of NASA. In this chapter the author will discuss, by means of formulating several propositions, the relationship between the aerospace industry and the Defense Department as well as NASA. The first proposition asserts that the greater the number of competitors seeking to absorb an agency's goals, the lower the probability that the suppliers and beneficiaries of that agency will support it. The second states that the stronger a bureau's competitors, the less likely the bureau's suppliers and beneficiaries will support that bureau. Concerning the applicability of these proposi-

tions to NASA's growth, I will attempt to show that the Army, Navy, and the Air Force, as well as NASA, were competing for the aerospace industry's services, but due to the relative size and number of these bureaus making up the Defense Department complex, the aerospace industries often catered to their requests rather than to the civilian space agency--NASA. This situation has led to interesting developments between NASA and the Defense Department which will be discussed in this study, e.g., the relationship between NASA and DOD has been steadily increasing since the early sixties.

In the last chapter I will summarize the theory behind the space agency's development in order to restate some of the causes behind NASA's unusual growth pattern. I will also reiterate the theoretical propositions set forth at the beginning of each chapter and discuss my findings. In doing so, I hope to make some possible predictions about NASA's growth in the future. In other words, I will be making some projections on what I think will happen to NASA in future years on the basis of the material gathered for the completion of this study.

This study is primarily concerned with the internal growth dynamics of one particular U.S. agency--NASA. This is not to say that the results of this study may not be utilized in analytical comparisons of similar agencies or bureaus in our governmental system. Without doubt, then,

studies of the growth patterns of bureaus such as this will greatly enhance the knowledge and understanding of public administrators, not to mention political scientists.

The scope of this study primarily entails a span of thirteen years, which includes NASA's initial conception in 1958 to the present. However, it has proven to be expedient in some sections of this study to include events occurring just prior to 1958. The launching of Sputnik I in 1957 is probably a good example. It is this single event above all others that probably heralded the need for the creation of NASA as a civilian space agency.

Material for this paper was gathered from a variety of sources. These include Congressional hearings and reports; newspapers, periodicals, trade journal articles; statements of those involved in space policy making; publications of NASA's Historical Program; other books about the space program; and books by or about individuals involved in space policy matters. Of all sources, the government documents related to NASA were of the greatest value because of their informative and voluminous nature.

It may also be mentioned that although the capsule fire of Apollo 204, which killed Chaffee, Grissom, and White, was probably the greatest tragedy of the space program, it nevertheless unfolded a plethora of critical analyses on NASA which have been crucial to this study.

Chapter 2

INTERNATIONAL IMPACT UPON NASA'S GROWTH AND DEVELOPMENT

In viewing any large scale changes in either the growth or decline of NASA we must first look to the international setting and the possible impact that some events have had upon United States space policy and NASA's growth. The basic premise here is that the space program since its conception has been largely tied to the national prestige and the national interest of the United States and that major policy decisions concerning space are made in regard to these two factors. The issue, as Kennedy saw it, was that the national interest required a large, prestige-oriented space program. It is no coincidence that the goal of landing a man on the moon was announced less than a month after the abortive Bay of Pigs invasion, which cost the U. S. a good deal of international support.

Paul Seabury conceives the national interest as "a kaleidoscopic process by which forces latent in American society seek to express certain political and economic aspirations in world politics through the highest organs

of the state."[1] National prestige, on the other hand, is defined by Vernon Van Dyke as:

> . . . consisting of a reputation internationally on four qualities: (1) the pursuit of goals that are creditable and that respond to the challenge of the time; (2) the capacity to achieve the goals; (3) the necessary determination to achieve them, provided it can be done responsibly, i.e., by means that do not involve the undue sacrifice of other desirable goals; and (4) an assured future, in which the other qualities making for prestige will be preserved if not enhanced. Deference, as distinguished from prestige, can be obtained on the basis of the second and third qualities alone, and the proviso attached to the third can be dropped.[2]

"Concerning space policy and national prestige, Kennedy's decision to develop the manned lunar landing and return as a national goal was a direct result of his more basic decision to reverse the policy that had guided the space program during the Eisenhower years."[3] The lunar landing decision for Kennedy was made in international political terms, and not with respect to national research and development policy as was found in Eisenhower's later years. To Kennedy, the space program was an instrument of

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[1]Paul Seabury, Power, Freedom, and Democracy: The Foreign Policy of the United States (New York: Random House, 1963), p. 87.

[2]Vernon Van Dyke, Pride and Power: The Rationale of the Space Program (Urbana, Ill.: University of Illinois Press, 1964), pp. 119-120.

[3]John M. Logsdon, The Decision to Go to the Moon: Project Apollo and the National Interest (Cambridge: M.I.T. Press, 1970), p. 137.

American foreign policy, a new means to elevate America's global power position. Kennedy made space policy decisions in light of the conditions of international politics.

Because of the salience of international politics and events with respect to the space program and the development of NASA, we should perhaps begin with a review of several key historical events and attempt to relate them to NASA's growth or decline. NASA's initial conception has been attributed by most authors in the field as a direct response to the Russians' first successful launching of Sputnik I on October 4, 1957. Sputnik I had a tremendous impact as a historical "first" in space. The feat itself cannot be questioned, but the public and official hysteria that followed in the United States was unusual under the circumstances. That is to say, it was unusual only because the U. S. had been discussing opening, for the most part, its own plans for a space shot for at least two years prior to the launching of the Russian satellite. In fact, Project Vanguard was slated to be launched prior to Sputnik but was held up by delays.[4] Possibly a culmination of many of

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[4]The Russians delivered an official report to the headquarters for the International Geophysical Year (IGY) on June 10, 1957, declaring the readiness of their satellite program. This was four months before Sputnik I was launched. They even announced the frequency on which its signals were to be transmitted. Meanwhile, interagency, i.e., Army, Navy and Air Force, rivalry and repeated failures to get Vanguard off the launch pad worked to slow the U. S. space program. Finally, the success of Explorer I was presented as evidence that the U. S. was not lagging too far behind the Soviets.

these factors, reaching a crescendo with the failure of Vanguard on the launch pad, placed the U. S. in a very dismal position for any exploration of space ahead of the Russians.

While the American public grew more uneasy over the Russian demonstration of talent, the Congress responded with a thorough investigation. In fact, both the Senate and the House had separate hearings, with a total of 108 witnesses, aimed at understanding the problems of space that confronted the nation. The Congress, like the general public, became quite concerned as to just how far ahead in space the Russians really were. In its investigations Congress came to the conclusion that the U. S. was about two years behind the Russians. The "gap" was not in scientific talent or in the ability to utilize talent but one primarily due to a lack of large booster development.

George V. Allen, director of the U. S. Information Agency under Eisenhower, also faced a problem in dealing with the question of the implications of space efforts for national prestige. He told the House Committee on Science and Astronautics that the Sputniks had greatly enhanced the prestige of the Soviet Union and that American prestige had suffered. He said, "All space activities are now seen within the framework of the Soviet-American competition. Regardless of how Americans may feel about it,

the world sees the U. S. in a space race with the U.S.S.R."[5] In reference to the hearing with Van Allen, a report was made stating that the emergence of scientific achievement is of great importance to world prestige and international influence. Thus, Congressional investigations at this time were very extensive and thorough in order to determine the U. S.'s position in space in relation to the Soviet Union. Actually, there was little cause for alarm at that stage of the space race because the United States was not a great deal behind the Soviets, although, as previously mentioned, they lacked large booster power. Nevertheless, the exaggerated responses of the Congress, the press, and the lay public produced inevitable results, some of which were clearly beneficial to the formation of a civilian space agency. Efforts were made immediately to get the separate space activities of various agencies all under one roof, with one budget and one broad mission--it was to be labeled the National Aeronautics and Space Administration.

Eventually, the national interests in space were outlined as to their importance, urgency, and inevitably in the history-making report of the President's Science Advisory Committee (PSAC). Four factors were cited as underlying America's space program: man's curiosity; the

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[5]U. S. Congress, House, Select Committee on Astronautics and Space Exploration, Astronautics and Space Exploration, Hearings on H.Res. 11881, 85th Cong., 2nd Sess., 1958, p. 512.

defense objective (i.e., "peaceful" defense against alien space powers); national prestige; and opportunities to add to our scientific knowledge of earth, the solar system, and the universe.[6] The National Aeronautics and Space Act, passed through the efforts of then Senator Lyndon B. Johnson and his staff, became law on July 29, 1958. By October 1, three days short of the first anniversary of Sputnik I, NASA had become firmly established. Thus, a new space agency was ushered in following the heavy clamor from Congressmen, the press, and vocal citizens over Russia's successful attempt in placing the first unmanned satellite into orbit. It is undoubtedly true that NASA's conception as well as its continued growth in its early years was heavily dependent on Russia's activity in space.

The early years of the space age were marked by numerous successes of a spectacular nature by the Russians. Sputnik I, of course, was spectacular because it was the first satellite in space. Sputniks II, III, and IV further confirmed Soviet capabilities.[7] These successful shots were proclaimed by the Soviets as validation of Communist preachments and prophecies about the superiority of their

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[6]For discussion of PSAC and its functioning see Robert Gilpin and Christopher Wright (eds.), Scientists and National Policy Making (New York: Columbia University Press, 1964).

[7]Vernon Van Dyke discusses other early Soviet shots--Cosmic Rockets I, II and III, in Pride and Power, p. 20.

political system. Naturally, the U. S. was active during this time and eventually proved its technical capability in space. The U. S. launched thirty-three payloads before 1960 and included were some of the notable firsts, e.g., the discovery of the Van Allen Radiation Belts. Nevertheless, the failure of Vanguard I on December 6, 1957 was a deeply mortifying response to Sputniks I and II, and by the end of 1960, thirty-four additional attempts to launch satellites or escape payloads had failed. A few vehicles were destroyed for safety's sake; some broke up in flight; the second or third stage sometimes failed to ignite or malfunctioned in another way; and moon shots failed to reach the moon.

As the number of American launches suggest, the U. S. space program achieved considerable magnitude under Eisenhower. Total budgets for space rose from 179 million to the 1.2 billion that Eisenhower planned for fiscal year 1961--a sevenfold increase. Perhaps most importantly, a program for the development of more powerful boosters under the direction of Werhner Von Braun at Huntsville, Alabama was initiated. Therefore, NASA and the space program were able to obtain substantial monetary support during the Eisenhower years even though the President maintained a conservative policy toward space.[8] He held to this policy

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[8]From Eisenhower's 1955 decisions dealing with International Geophysical Year to his 1960 disapproval of NASA's plans for flights around the moon, "Eisenhower followed a rather conservative policy in space." Ibid., p. 22.

despite repeated challenges to it and to its premises by those in Congress and those in military and civilian life who believed, as Eisenhower did not, that the political and psychological impacts of space achievements were very important factors in international politics, factors which, as John Kennedy was later to claim, "may hold the key to our future."[9] Eisenhower's space program then had a conservative and careful aura about it which relinquished national prestige for hard scientific data and accomplishments. NASA's administration, especially its director, Keith T. Glennan, reflected this attitude towards major goals in space. As a result, NASA advanced in space, but at a very slow rate.

When considering the relationship between external and internal factors, one would have to say in light of the evidence presented, that external factors, e.g., Russian activity in space, were the major impetus in forming NASA as well as accounting for most of its growth; while internal factors, such as Eisenhower's perception of the dangers of a new power in the military-industrial complex was a source of restraint in growth. We will see later in this study that even the functions and structure of NASA has been altered by these external and internal factors in its environment.

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[9]U. S. Congress, Senate, Committee on Aeronautical and Space Sciences, Documents on International Aspects of the Exploration and Uses of Outer Space, 1954-1962, 88th Cong. 1st Sess., Senate, Document No. 18, 1963, p. 202.

NASA was still heavily dependent on interagency cooperation, especially between the Army, Navy and Air Force. It was also, and still is, greatly dependent on the executive branch of the U. S. Government for policy formulation and the legislative branch for appropriations. "Therefore, NASA has not achieved what Downs describes as its 'survival threshold' and thus does not act as a functionally autonomous agency."[10] NASA's growth has been dependent upon politicians and engineers to control as they see fit according to world events.

After 1961, and the beginning of the Kennedy era, NASA took on a new look as a more active and viable agency. Shunning the more conservative cloak of the Eisenhower Administration and gaining a new emphasis on national prestige and national interest, NASA became more important on the international level. Soon after Kennedy took office, he recognized that national prestige was an important factor in world politics, and thus he soon linked it with spectacular space achievements. He became convinced that space achievements were linked closely to the power relationship between East and West, and were symbolic manifestations of national determination and vitality. Once Kennedy did make such a connection, however, he determined that Eisenhower's

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[10]Survival threshold implies a level of security whereby a bureau is large enough to render useful services, and old enough to have established and routinized relationships with major clients. Anthony Downs, Inside Bureaucracy (Boston: Little, Brown, and Company, 1967), p. 9.

policy should be modified, and that "we should go to the moon." Overall, Soviet space successes had prompted a re-evaluation of American education and technology; they brought to the surface many unsolved problems and unsatisfied demands in most sections of American society. "Two classified surveys of overseas public opinion, prepared by the U. S. Information Agency and intended for the use of the executive branch, were leaked to the press just ten days before the November 8 elections; both showed that U. S. prestige relative to that of the Soviet Union had declined during the Eisenhower presidency, and that U. S. allies in Europe believed that the Soviet Union's space successes presaged a Communist trend to be predominant military and technological power in the world."[11]

The first study reported that "U. S. space successes . . . have generated quite limited awareness in Great Britain, and while productive of some improvement, still left the U. S. far behind the Soviets in space leadership. . . current French opinion continues to put the U.S.S.R. overwhelmingly ahead. . . ."[12] The second report, dated October 10, 1960 was "The World Reaction to the U. S. and Soviet Space Programs--A Summary Assessment." Polls were taken in Britain, France, West Germany, Italy, and Norway and were based on

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[11]Logsdon, Decision to Go to the Moon, p. 65.

[12]The New York Times, October 27, 1960, pp. 28-29.

reactions to the nations' space programs. The report concluded that "in anticipation of future U. S.-U.S.S.R. standing foreign public opinion. . . appears to have a declining confidence in the U. S. as the 'wave of the future' in a number of critical areas of competition."[13]

Kennedy was noted for responding to this dilemma by stating that "If the Soviet Union placed the first man in outer space, it would be the most serious defeat that the U. S. would suffer in many, many years. . . . Because we failed to recognize the impact that being first in outer space would have the impression 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 were standing still."[14] Therefore, although Kennedy in the first few months of his administration did not actively involve himself in space policy, he was aware of its significance.[15]

Action was soon taken to establish a central direction of the civilian space agency. Activation of the Space

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[13] Washington Post, October 29, 1960, p. A.L.

[14] Van Dyke, Pride and Power, p. 23.

[15] At the outset of Kennedy's Administration, "he seemed to know less and to be less interested in issues of space policy than almost any other set of policy questions." See Hugh Sidney, John F. Kennedy, President (New York: Athenium Press, 1964), p. 59.

took place in March of 1961 and Vice President Lyndon Johnson, who did much to establish NASA while Majority Leader in the Senate, chaired the Council. Functions of the chairman and the Space Council were stipulated by Kennedy. Having general supervision over NASA, Johnson would receive all reports, plans, and policy documents that would ordinarily have been sent to the president--although the president would approve important decisions. Thus, NASA became even more closely tied to the White House, which provided it with a competitive advantage superior to most other agencies buried in the administrative structure of the executive branch. Its stability as a viable governmental agency was relatively insured because of the space program's impact on world opinion and because it was coordinated through the White House.

Still, the Kennedy task force was highly critical of NASA at this time, especially over NASA's proposed program for a manned space flight.[16] "The President's Science Advisory Committee (PSAC) chaired by Jerome Wiesner, called Project Mercury 'marginal' and pointed out that because of the U. S. lag in boosters, it was 'very unlikely' that the United States would be the first to orbit a man."[17]

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[16]The Kennedy task force on space was called the President's Science Advisory Committee (PSAC). PSAC was originally formulated under Eisenhower to review the space program and to recommend changes in space policy.

17. Logsdon, Decision to Go to the Moon, p. 73.

It was critical of the relative priorities given to manned and unmanned flight. One of the failures that the Wiesner Committee feared was an attempt to place an American in space resulting in the death of an astronaut, or worse yet, failure to recover him from orbit. It is also important to note that at this time, NASA's flight program was characterized by a very high percentage of unsuccessful launches, primarily due to unreliable launch vehicles and boosters.

Even Kennedy himself and his staff focused their attention on other matters at this time. They had to first consider the nation's defense, decisions on new foreign policy initiatives, issues on preparing legislation leading to domestic social welfare programs, and on combating the 1960-1961 recession. At this time, Kennedy was also deeply involved with his first crisis, i.e., the decision on whether or not the U. S. should intervene in Laos.[18] Arthur Schlesinger, one of Kennedy's presidential advisors, reported that in the first two months of his administration Kennedy spent more time on the Vietnam and Laotian interventions than on any other matter.

Kennedy, then, at the outset of his administration, had not made up his mind as to what his general attitude toward a manned space flight would be. One reason for his

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[18]The pro-American government of Phoumie Nosavan seemed near military defeat by the Communist Pathet Lao forces, as well as the government of Ngo Dinh Diem in South Vietnam.

hesitation to approve the Apollo project was the uncertainty which plagued the success of Project Mercury. Still, Kennedy seemed to lean toward the approval of Apollo when influenced by members of the NASA administration, especially Earl Webb, its director, who was personally appointed by Kennedy to that position. Webb pointed out that if the U. S. did nothing in space while the Soviet Union went on from one triumph to another, American prestige would be seriously jeopardized. Webb said that:

> A tendency exists in some quarters to belittle the psychological value of Project Apollo. Think . . . what the reaction would be in this country if the Soviets made a successful landing on the moon and we had no plans and no potential for getting there. Certainly such a situation would be very damaging to our position throughout the world. The uproar after the first Sputnik would be mild indeed compared to the storm that would follow.[19]

Kennedy listened intently to this message. Thus, this type of argument greatly buttresses the proposition that external factors such as possible Russian prestige in space greatly aided NASA's overall growth.

Nevertheless, very few people in Washington in early 1961 expected a new look of the space program to come as soon as it did. But during the month of April a crisis period arose which forced space planners and government

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[19]James E. Webb, "National Goals in the Space Age," in NASA, Office of Scientific and Technical Information, Proceedings of the Conference on Space Age Planning, May 6-9, 1963, Chicago, Illinois (Washington, 1963), p. 4.

policy-makers to examine our national goals and space programs. Kennedy was informed by his intelligence sources early in April that a Soviet flight attempt would soon be made. "On the evening of April 11th Kennedy was told by Jerome Wiesner that the Soviet flight would probably occur during the night."[20]

Wiesner was correct. A dispatch from Moscow announced:

> The world's first space ship Vostok with a man on board, has been launched on April 12 in the Soviet Union on a round-the-earth orbit. The first space navigator is Soviet citizen pilot Major Yuri Alekseyevich Gagarin.[21]

Krushchev, who was quick to take advantage of such an opportunity, snapped, "Let the capitalist countries catch up with our country!" Adding further to the response, East German leader Ulbricht added that the flight "demonstrates to the whole world that socialism must triumph over the decaying system of yesterday." Propaganda emerging from the Soviet block stressed several themes: (1) the Gagarin flight was evidence of the virtues of "victorious socialism," (2) the flight was evidence of the global superiority of the Soviet Union in all aspects of science and technology.

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[20]Sidney, Kennedy, President, p. 111.

[21]Lloyd S. Swenson, Jr., James M. Grimwood, and Charles C. Alexander, This New Ocean: A History of Project Mercury (Washington, D. C.: NASA, 1966), p. 332.

On an international level many countries were unanimous in praise and exhaltation for the Russians' great achievement. Great Britain heralded universal praise for the Soviets in their achievement. France's news media was filled with accolades to the Soviet's space spectacular. And in Italy, the Vatican called the voyage "a universal good."

In America, the event cost the nation heavily in prestige and marred the political and psychological image of the United States abroad. It was then that Robinson and Snyder considered our manned program for a lunar landing to have been made in crisis situation. Snyder and Robinson feel that certain criteria are needed for distinguishing whether a situation is crisis-like or not. These criteria are:

"(1) The extent of anticipation and prior programming.

(2) The ratio of time available for making a decision to the demands of the task.

(3) The scope and domain of the values at stake."[22]

They characterize decisions that arise without prior planning, allow short time for response, and have high value consequences as most crisis-like decisions. Using

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[22]James Robinson and Richard Snyder, "Decision Making in International Politics," International Behavior: A Social-psychological Analysis, ed. Hubert Kelman (New York: Holt, Rinehart, and Winston, 1965), pp. 440-442.

these criteria, the decision to strengthen NASA and develop a lunar landing program was very clearly crisis-like. This is important to note because, although the lunar landing program had been discussed for several years, it still had not received due attention until a state of high urgency arose, i.e., Gagarin's orbital flight.

The situation stood with the world believing that the Soviet Union was the most scientifically and technologically competent nation in the world. Jerome Wiesner stated that "We are paying a price in all kinds of ways--internationally, politically"--and that was the issue that the president was dealing with.

The most vocal responses came from Congress. Hearings, especially in the lower House, were conducted in an atmosphere of panic, fear, and almost hysteria over the Soviet's success in space. Republican James Fulton, speaking to Webb and Dryden during a session of the House Committee on Science and Aeronautics, said, "I believe we are in a race, and I have said many times, Mr. Webb, 'Tell me how much money you need and this Committee will authorize all you need.'"[23]

Another statement by Representative King (Rep., N.Y.) probably best reflects the Congressional mood toward a

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[23]U. S. Congress, House, Committee on Science and Astronautics, Discussion of Soviet Man in Space Shot, 87th Cong., 1st Sess., 1961, p. 7.

greater buildup of the space program and NASA. He states:

> I would like to suggest that we are in a specific race with the Russians. Who will get to the moon first? In our race for the exploration of space there are three major breakthroughs or dramatic successes. . . The first satellite, the first man in space, and the first man to the moon and back.
>
> The score is two to nothing, in favor of the Russians. We still have the third prize to obtain. I think the third is probably worth more than the first two together. So we are still in the race.[24]

Kennedy was well aware of both the public and Congressional support for the space program. He also knew that this support would enhance his position as President because he had already experienced heavy frustration in obtaining passage of his previous programs. He soon accepted the space program as being his own.

The impact of the Soviet challenge in the Gagarin flight greatly enhanced NASA's position as a governmental agency. It experienced rapid growth during this time with its expanded budget.

Another international event, and thus external factor, which aided NASA's growth at this time was the failure of the Bay of Pigs invasion. This failure on the part of the Kennedy Administration left a large vacuum in foreign policy and national prestige which was to be filled temporarily by the United States' success in space.

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[24]U. S. Congress, House, Committee on Science and Astronautics, 1962 NASA Authorization, Hearings on H. R. 3238 and H. R. 6029, 87th Cong., 1st Sess., Part 2, 1962, p. 828.

The fiasco of the Bay of Pigs reinforced Kennedy's determination to approve a program aimed at placing the United States ahead of the Soviet Union in the competition for firsts in space. It was one of the many pressures that converged on the president at the time, and thus its exact influence cannot be isolated. As president, Kennedy could treat few issues in isolation, and there seems to be little doubt that the Bay of Pigs was in the foremost of his thoughts as he called Lyndon Johnson to his office on April 19 and asked him to find a space program which promises dramatic results in which we could win.[25] Such external pressures contributed greatly to NASA's prestige among U. S. priorities. Actual growth at this time was evidenced by additional funding by Congress for both Gemini and Apollo programs. Larger boosters were being developed and centers around the country were expanding.

On May 5, 1961, Alan Shepard made his successful suborbital flight which brought a wave of national relief and pride over the U. S. Later Kennedy announced his intention to accelerate the space program and that he planned to undertake a substantially larger effort in

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[25]The Bay of Pigs invasion consisted of a group of Cuban exiles, trained and financed by the CIA, who attempted to invade Cuba and overthrow the Castro regime. The invasion began on April 15, 1961 and on April 19 it was declared a total failure.

space. It was later reported that Kennedy planned to add $600 million to the civilian and military space budget.

The NASA budget was increased by $549 million for the Fiscal Year 1962, which was coupled with a $126 million March increase. This represented a 61 percent increase in the NASA budget over the Eisenhower figure of $1.1 billion. The Department of Defense was given $62 million for work on solid-fuel boosters.[26]

Kennedy's recommendations for setting a lunar landing as a national goal found immediate and almost unanimous support not only in Congress but also across the nation. In only eight months between September 1960 and May 1961 the status of manned space flight had reached a new high in United States priorities. It seemed to have an unlimited future.

With the support of Congress, the President, and the nation as a whole, NASA soon began to move at an accelerated pace. NASA then, experienced rapid growth as a bureau in both its size and the relative social significance of its functions. This occurred, as previously cited, in response to external environmental conditions favorable to the expansion of the bureau's functions,

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[26]James Webb, NASA Press Release, May 25, 1961.

i.e., development of scientific and technological knowledge about space with a subtle emphasis on winning the race to the moon over the Soviet Union.

This accelerated expansion seen through the early Sixties was perhaps highlighted by John Glenn's first American orbital flight in February, 1962. The flight inspired feelings of tremendous pride and quiet jubilation. It was a monumental achievement of which America was certainly proud, and it revived a feeling of pride and self-confidence.

Such a successful flight is said by many authors to have placed far too much confidence in America's technical capacity in space. With the national prestige high, and the national morale restored, a concern for prestige and pride lost some of its force as a motive for a space program. The growth acceleration soon ran into obstacles. Anthony Downs best describes NASA's rising difficulties as "trying to produce impressive results as its organization grew larger and more unwieldy." Continuing, he states that, "a bureau cannot generate external support (except among its suppliers) without producing services beneficial to someone outside its own members. Therefore, a bureau must periodically come up with impressive results if it wishes to sustain its growth."[27] NASA's staging of

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[27]Downs, Inside Bureaucracy, p. 12.

dramatic events over well-spaced intervals best illustrates this concept. As it has grown larger and taken on more functions, it has become increasingly difficult to produce convincing results. An example of a new function was the development of a manned lunar program which had limited scientific and military implications. The commitment to a lunar landing has constituted a policy of impressive results that took too long to achieve.

Downs also states that "as the accelerating bureau grows larger, it encounters more and more resistance to further relative growth of its functions at the expense of other activities of society."[28] Senator Fulbright best described the changing mood by saying: "Are there not other factors involved in our prestige and self-esteem, such as our capacity to employ and educate, to house and transport our own people?"[29]

The change began to show in Congress in the spring of 1962 following John Glenn's orbital flight. Many Congressmen began favoring cooperation with Russia in space or at least they lessened their desire in some form to beat the Russians. This resulted in doubt about the justifiability of the entire program, particularly the projected manned lunar landing. For the most part, the shift in attitudes

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[28]Ibid.

[29]J. William Fulbright, "The American Agenda," Saturday Review (July 20, 1963), p. 15.

was due to increasing awareness of the influence of pride and to a genuine belief that the desire to bolster it through a lunar landing did not justify the great expenses involved.

Such a shift of attitudes has also led to internal dissension in the organization itself. This dissension has developed mainly between the engineers and the scientists, causing a structural and functional rift in NASA.

The problem exists because, traditionally, NASA has put technology before science. "This approach led to the resignation of three of the elite handful of scientists--astronauts, and the departure of several top scientists from the Apollo program as well as angry mutterings from the academic community that space officials were slighting science."[30] The rift between scientists and engineers was perhaps strongest during the Mercury flights in 1961 and 1962 and over the years the struggle produced constant tension and shaky compromises. Recently, scientists have been urging NASA to devote its energies to a sustained series of flights seeking greater knowledge of the moon's origin and evolution. But most engineers are still eager to build bigger spacecraft and better rockets and push on to other planets. The scientists became greatly disappointed over the shift in goals of NASA during Kennedy's Administration. Previously, the Eisenhower Administration had stressed the peaceful purposes

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[30]Johnathan Spivak, "Rift in NASA: Scientists Make Gains in Clash with Engineers over U. S. Space Goals," Wall Street Journal, November 14, 1969, p. 1.

in space to avoid the appearance of militarism, and thus stressed the scientific aspect of the program.

While Kennedy and Johnson were in office, however, the space effort was aimed more at the glamorous and spectacular aspect of a manned lunar flight, rather than the scientific nature of the program. Commenting further on the science/engineering rift, Dr. H. H. Hess, once chairman of the Space Science Board of the National Academy of Sciences, asserted that "the lunar program does not have the enthusiastic support of many scientists" and explained that it was "primarily an engineering, technological, and biomedical project, not a basic scientific effort."[31] Many scientists were worried that a man-in-space program would cost more than the scientific returns would justify. They felt that the same returns and more could be gathered by fully automated unmanned space probes.

Some scientists' protests and private pressures finally began to have an effect on NASA's priorities. More scientists have been and are now being trained as astronauts for future lunar flights. In fact, moon shots have been interspersed as to allow the development of technical instruments which will take years to produce. Therefore, internal developments between the scientists and the engineers have brought about a reevaluation of the goals of the

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[31]Van Dyke, Pride and Power, p. 95.

space program as well as a change of procedure, such as stress on automated flights and broader scientific coverage. Also, more scientists over the years have been phased into administrative positions and thus have realigned some of NASA's operations.

The main impetus which formulated this reevaluation of the space program to its original goals has been the slackening of Russian activity in space (although within the last year the Soviets have become more active in the development of the orbiting space station, Salyute). It is this period of "external slack" which has allowed the President, Congress, and the American people to reevaluate the importance of landing a man on the moon. Because of the prior outbacks and major slowdown of NASA, its functions again began to compete allocationally with other programs for social attention and resources.

People then, may not become aware of a value until a threat to it develops; and if the threat recedes, concern for the value may recede. This can be clearly seen in reference to NASA's growth dynamics. It took the external, international factors of Sputnik and Gagarin's flight to awaken the American people and Congress to some precious values--especially to the importance of pride; and with the restoration of pride, concern for it diminished.

NASA then had an unprecedented rate of growth in the early Sixties, which seemed to be in response to external

factors or events in its environment. The lack of those same factors caused a leveling and finally a tapering effect upon NASA in recent years, especially since 1967. With the lack of an external threat, internal factors became important; i.e., scientist and engineer rifts, as well as a questioning of the basic goals and functions in relation to other competing elements in society. Clearly, NASA is in deep trouble as an agency of the government if its social functions do not expand. This situation will be dependent upon other external or exogenous factors in its environment other than Russian activity in space. These other factors are primarily NASA's supporters and beneficiaries, industry and the Department of Defense. Because of the importance of these two elements, we have devoted the next two chapters to an analysis of their relationship with NASA and how they have affected NASA's growth as a governmental agency.

Chapter 3

NASA AND THE DEPARTMENT OF DEFENSE

Having considered the ways in which international factors have provided a major impetus for the overall development and growth of the National Aeronautics and Space Administration, we should now turn to another important external factor which has greatly affected NASA's growth dynamics, the Department of Defense (DOD).

Most bureaus or agencies have functional and allocational rivals in at least one area, and NASA is no exception. As one of the newer bureaus of the late Fifties, NASA was especially vulnerable because its initial external sources of support were generally weak, or at least were not routinized into a relationship with the space agency. Perhaps the basic problem was a lack of organizational autonomy because of its dependence not only upon the executive branch for direction and the Congress for appropriation, but also upon the DOD, because the Army controlled booster power, the Air Force launched the missions, and the Navy directed important research and rescue functions for the space program. In its formative years, NASA lacked the relative autonomy needed for control of in-house activities. Autonomy gives an organization a stable claim to resources and places it in a favorable position to compete with other

groups for those resources. Lack of autonomy was a major factor retarding NASA's growth prior to Sputnik because it was under constant threat of being absorbed by its much larger functional and allocational rival, the DOD.

The question of military versus a civilian space agency dates back to the Eisenhower Administration. In April 1955, President Eisenhower approved plans for launching an American satellite; he designated that the earth satellite program be separated from, and not interfere with, DOD work on long range ballistic missiles. The separation of the satellite mission from the development of military hardware meant that the satellite program was to be conducted for scientific purposes only.

This policy was somewhat altered upon the successful launching of Sputnik I by the Soviet Union in 1957. Nevertheless, Eisenhower remained fairly firm in his intention to make the space program a civilian and scientific effort rather than a military campaign. Eisenhower's stand on the issue of placing the military in a secondary role in space can best be seen in the following statement:

> If the project is designed solely for scientific purposes, its size and its cost must be tailored to the scientific job it is going to do. . . .--If the project has some ultimate defense value, its urgency for this purpose is to be judged in comparison with the probable value of competing projects.[1]

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[1]U. S. Congress, Senate, Committee on Astronautical and Space Sciences, Documents on International Aspects of the Exploration and Uses of Outer Space, 1954-1962, 88th Cong., 1st Sess., 1963, S. Doc. 18, pp. 50, 51.

One of Eisenhower's most important reactions to Sputnik I was to grant American scientists increased access to the highest echelons of national policy making. In the several weeks following the launch of the Soviet satellite, more scientists met with the President than had done so in the previous ten months. The President's Science Advisory Committee (PSAC) moved from a limited and low-level position in the Office of Defense Mobilization to the White House. PSAC was given the full responsibility for laying out in more detail the goals of the national space program. It listed four important goals of the program as: "(1) fullfill the compelling urge of man to explore and to discover; (2) the defense objective; (3) the factor of national prestige; (4) provide new opportunities for scientific observation and experiment."[2] PSAC thus revealed the need to establish a civilian-oriented space agency, rather than one under military management. The Committee felt that it would not be in the best national interest to exploit space science at the cost of weakening U. S. efforts in other scientific endeavors. Probably the most lasting effect of the Eisenhower space policy was his insistance on separating civilian and military space efforts and on giving the primary emphasis to civilian efforts. The decision to establish NASA, the civilian space agency, was a direct

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[2]Robert Gilpin and Christopher Wright (eds.), Scientific and National Policy Making (New York: Columbia University Press, 1964).

result of that policy.

Out of the Eisenhower Administration emerged a coordinated space program. Nevertheless, supporters of the program could not agree on the specific features of the program. Rivalry between the Armed Services, especially the Army and Air Force as well as NASA, aided in fragmenting the program. Even the National Space Council, whose purpose was to help coordinate these elements and set policy directions, had little support from the President. In fact, Eisenhower received support from the House to abolish the Council. This move, however, was later aborted by Lyndon Johnson, then Senate Majority Leader, who felt that the Council would be important in the future. Rivalry among the Armed Forces and with NASA for control over the space program was perhaps greatest in relation to the manned space program. Against this background of disequilibrium in the space policy-making process, several decisions emerged which greatly affected NASA's overall growth: first, the assignment of responsibility for manned space flight programs to NASA in mid-1958 and second, the transfer of the Saturn booster program from the Army Ballistic Missile Agency (ABMA) to NASA.

NASA was now competing heavily with a much larger and stronger functional rival, the Air Force. The Air Force had long planned a program for a manned space flight with an initial objective of achieving satellite flight

as soon as possible. In fact, the Air Force had competed heavily with NASA's predecessor, the National Advisory Committee for Aeronautics (NACA).[3] By mid-1958, the President assigned the responsibility for the nation's first manned space program to NASA.

The Air Force, or at least its space-oriented division, never completely reconciled itself to this decision. All through 1959, and 1960, the Air Force continued to campaign for a military flight program. The Air Force campaign continued throughout the Sixties and still provides a major threat to NASA today.

The second major decision was the transfer of the Army Ballistic Missile Agency's (ABMA) Von Braun team to NASA. Dr. Wernher Von Braun and his associates were developing large boosters required to launch much heavier satellites. Problems arose in developing the large boosters (Saturn series) and the program was transferred to the Air Force. This decision was followed by months of Army-Air Force conflict, and left the Army with a space booster team but no mission for its use. The Air Force, of course, insisted that the Von Braun team also be transferred to them, but the ABMA opposed the Air Force request. Because of this opposition between Army

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[3]The Air Force, and especially the Ballistic Missile Division of the Air Research and Development Command (ARDC), had been interested in developing an Air Force manned space flight capability since 1956.

and Air Force, the Army finally supported a transfer of the team to NASA. NASA now had the manned space flight mission, the spacecraft, and the booster experts to carry out its mission. Plans for a full-fledged moon program were finally to be realized, and as a result, NASA grew by enormous strides. It was shortly after this time that NASA began to achieve support from President Kennedy as well as increased support from Congress. This unprecedented support enabled the civilian space agency to withstand the many pressures placed upon it by its military competitors. Even the nation's communications media were stressing the manned flight program of NASA. This emphasis seemed to strike a responsive note with the American people, indicating at least a latent support for future manned flights.

The rivalry between the Army and the Air Force provided a divided opposition which favored NASA because both the Army and the Air Force preferred to give concessions to NASA rather than to each other. This type of external stimulus greatly aided NASA's growth and its stability in later years.

These early concessions have helped draw the defense system closer to NASA. "Air Force planners now agree that they can benefit from NASA's work and they and the civilian agency are establishing more joint committees and lines of liaison to assure that each benefits from the

other's progress."[4] As a result, a positive relationship between NASA and the Department of Defense (DOD) has been steadily increasing since the early Sixties. "The trend has accelerated partly due to the fact that both the Congress and the Executive Branch have seemingly favored spending money on anti-poverty programs or 'hard' defense goals."[5] It has been important for NASA to maintain the guise of a peaceful space agency in order to gain and maintain public support for all space projects and yet give the DOD space efforts an effective "cover."

This improved relationship between NASA and the DOD has been an important underlying factor in NASA's stability and growth dynamics. Such a union has provided general support from the powerful defense-oriented bloc within Congress. This Congressional bloc had normally defeated major appropriations bills to NASA as a civilian agency. It is for this reason that NASA administrators have taken full advantage of major defense spin-offs that have accrued from NASA's technical capabilities. "NASA is careful,

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[4]Editors of Fortune, The Space Industry: America's Newest Giant (Englewood Cliffs, N. J.: Prentice Hall, 1962), p. 33.

[5]Erlend A. Kennan and Edmund H. Harvey, Mission to the Moon: A Critical Examination of NASA and the Space Program (New York: William Morrow & Co., 1969), p. 216.

however, in not overdoing the defense tie-up because it must not only maintain a cover up for some defense projects but it must also protect itself from being too fully absorbed into the defense department or be abolished all together."[6]

In reviewing the NASA-DOD relationship it is evident that it began during the late Fifties. At this time NASA relied heavily upon the Army for its booster power as well as upon the Air Force for mission control. Continuing into the Sixties, the Defense Department gained a strong hold in the field of space. Appropriations for military space activities were larger than appropriations for NASA until the Apollo program was initiated. The most obvious and least controversial military applications of space technology are now found generally in the areas of communication, navigation, meteorology, and geodesy, where a considerable amount of non-military applications overlap.

One of the earlier military efforts to balance the Soviet space threat was a project called "Samos." "Samos," as a reconnaissance satellite, was used to replace the former U-2 planes. Its cameras and other devices provided intelligence concerning the precise location of Soviet missile launching sites. Another program, unofficially

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[6]Ibid. Kennan and Harvey report that approximately 75 percent of NASA's Space Vehicle Division effort, while aimed at NASA objectives, is of direct benefit to DOD.

called "Ferret," provided satellites that could intercept radio, radar, and microwave telephone transmissions in the Soviet Union. Still another military satellite was nicknamed "Midas," which was originally equipped with infra-red sensors to detect enemy missile launchings. This satellite, however, proved unsuccessful after the military discovered that the satellite's infra-red devices could readily be tripped by heat from large industrial furnaces in the Soviet Union.

These military adventures are listed here only to demonstrate how DOD activity in space overlapped with that of NASA. An example of a logrolling strategy was the close relationship between the Apollo Applications Program (AAP) of NASA and the Manned Orbital Laboratory (MOL) of the Air Force. The Apollo Applications Program (AAP) was a series of shots designed to make use of leftover Apollo hardware after the moon landing had been accomplished. Its purpose was to conduct long-duration space flights and to perform scientific investigations in earth orbit. The Manned Orbital Laboratory (MOL) of the military was very similar except that maneuvers would be of a defense nature and highly secretive. Many governmental officials felt that both programs led to duplication. NASA defended AAP and MOL by stating that the programs were not directly related and that NASA was cooperating with the MOL project.

The Republican Platform and Richard Nixon in 1968 deplored the lack of emphasis on the military use of space for America's defense. Now Nixon's Administration has tended to favor financial cuts in the civilian space program. Consequently, the military has succeeded in gaining stature with Washington at NASA's expense. This can be clearly seen in the major slowdown that both NASA and the aerospace industry have been experiencing over the last five years. With NASA's famous shot to the moon completed and its slowdown continuing, it has sought closer ties with its larger competitor--the Department of Defense (DOD).

Richard Lyons of the New York Times, in an October, 1968 issue, wrote that:

> NASA, which was once reluctant about associating itself with the military uses of space, now appears more relaxed. In order to sell the space agency to Congress and the taxpayers, NASA officials now adopt the line that military objectives are among the beneficial "spinoffs" from the 43-billion [spent through 1968] national space program.

Much of NASA's defense work is based upon a clause in the 1958 National Aeronautics and Space Act (amended in 1962), which directs NASA to make discoveries available to agencies directly concerned with national defense. The Act also enables the military to provide NASA with information which is of value to that agency.

Some of the areas in which NASA has been working closely with DOD are cited in the following paragraphs.

"DOD technology requirements and research activities are taken into account in the formulation of practically all of NASA's research and technology programs."[7] Seventy-five percent of NASA's Space Vehicle Division effort, while aimed at NASA objectives, is of direct benefit to DOD. NASA boasts of its 5,611 man-hours in testing a Titan rocket model, 2,900 man-hours conducting wind tunnel tests on Titan 3, and 15,000 more man-hours testing a one-fifth size scale model of the Titan 3, all for the Air Force.

NASA is also gaining a larger share of research concerned with the Vietnam War. "The Space Agencies Office of Advanced Research and Technology has spent between 4 million and 5 million dollars a year directing the efforts of 100 scientists and engineers on tasks vital to the Vietnam War."[8] One of NASA's "limited warfare" teams has been developing a super-quiet aircraft engine that will enable aircraft to drop their payloads before the enemy is aware of their presence.

The House Subcommittee on NASA Oversight stated that NASA could loft a syncronous satellite over southeast

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[7]Ibid., p. 207.

[8]Ibid., p. 208.

Asia. The satellite would be equipped with a huge mirror designed to reflect the sun's rays for twenty-four hours daily, thus providing light for the darkened jungles. Finally, the project was abandoned due to protests from civilian astronomers and naturalists.

NASA has always worked closely with DOD, but has acknowledged its close relationship only recently. One aspect of the relationship between NASA and DOD is the "old soldiers and sailors" clause in the NASA Act of 1958. This clause authorizes (but does not require) the administration to employ retired commissioned officers of the Armed Forces of the United States. This clause has resulted in NASA's becoming heavily manned with admirals and generals, as well as with engineers of which the Armed Forces has a large supply. For example, "at the end of 1967, there were 323 military personnel 'on detail' to NASA. These included 189 from the Air Force, 99 from the Army, 32 from the Navy and three from the Marine Corps."[9] Engineers compose the largest segment of the NASA operations and many of these engineers are retired commissioned officers from the service. Engineers, especially at the administrative level, have been responsible for the technology development of NASA's Apollo moon project. This has caused a personnel

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[9]Ibid., p. 215.

imbalance which has resulted in a "lump" effect in the organization's manpower structure. Such an abundance of retired military personnel and engineers in administrative positions has aroused an outcry from the deprived scientists in the program. The scientists have felt the pressure in the engineer-oriented moon program. This has led to internal dissension and goal realignment in future programs. The likelihood that the scientists will become as important as the military or the engineers in future NASA space programs is doubtful.

It is concluded that not only is NASA's program more or less defense-oriented, but there has always existed, concealed from public scrutiny, a vigorous Defense Department space program. NASA is not the only agency whose functions relate to the space effort, and thus NASA has been experiencing more and more pressure from its stronger and larger competitor--the DOD.

NASA has realized its dilemma and has tried to shift many of its peaceful functions in space explorations to more defense-oriented programs in order to gain Congressional and Executive support. Anthony Downs in his book Inside Bureaucracy refers to this procedure. He states that "bureaus are often willing to shift functions in order to survive; hence the relative decline of their initial social functions will not kill them if

they are agile enough to undertake new and more viable functions before it is too late."[10] Starbuck elaborates on this by stating that "as a bureau ages, its officials become more willing to modify the bureau's original formal goals in order to further the survival and growth of its administrative machinery."[11]

NASA, however, in its attempt to remain a viable agency, may have gone too far by adopting defense measures in its programs. Originally NASA was to be a civilian agency working in the scientific aspect of peace. Now the bureau's original goals are being modified to include national security and national prestige. The danger in modifying such goals is that NASA's functions may be a duplication of the DOD's work in space. Under such a situation, NASA is in danger of being absorbed by its much larger functional rival. The tragedy is that the "civilian" space agency is slowly being whittled away, while the space portion of the DOD is obtaining funds taken from NASA. Figure 2 illustrates how DOD's space spending has risen every year since 1966, while NASA's budget has

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[10]Anthony Downs, Inside Bureaucracy (Boston: Little, Brown & Co., 1967), p. 23.

[11]William H. Starbuck, "Organization Growth and Development," Handbook of Organizations, ed. J. G. March (Chicago: Rand McNalley, 1964).

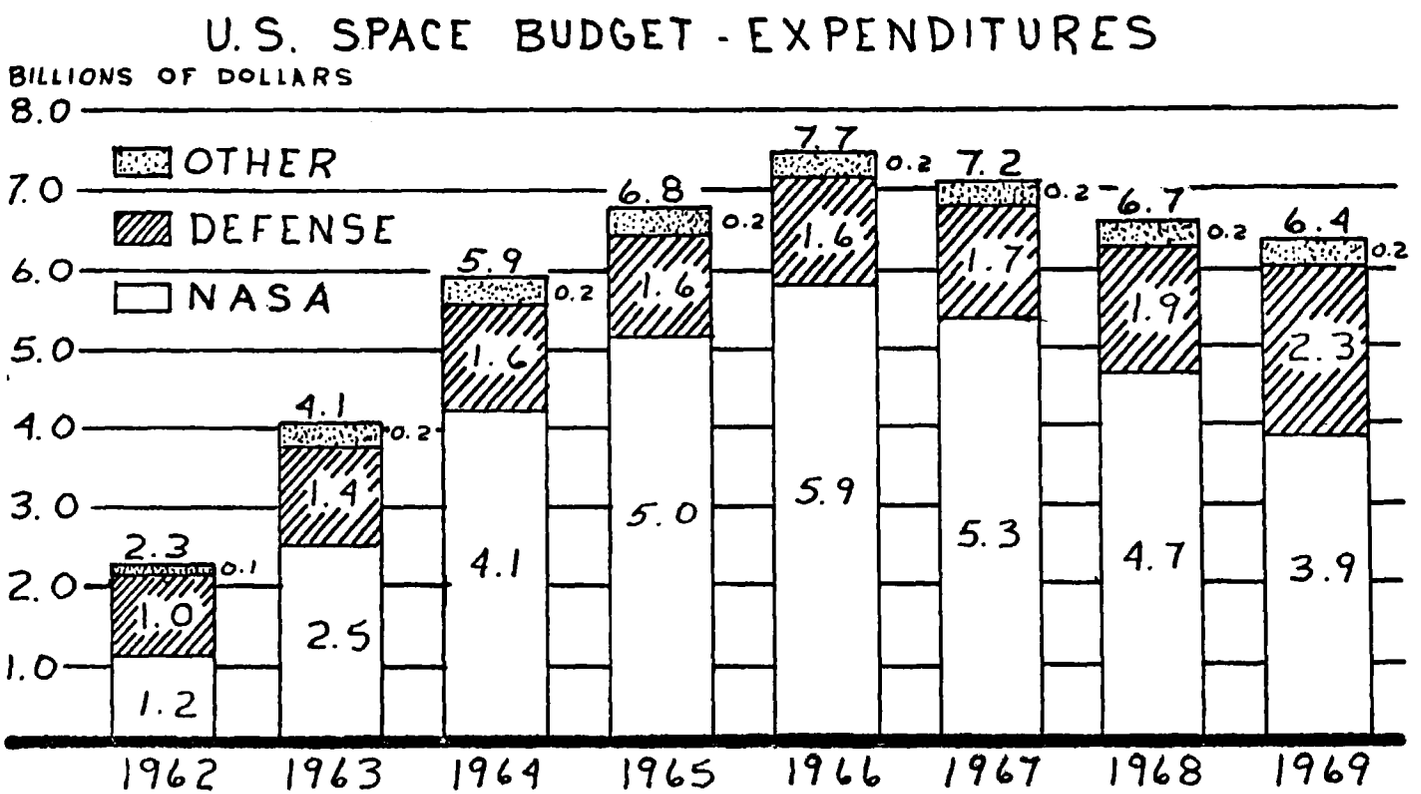

Figure 2. U. S. Space Budget, 1962-1969

SOURCE: Kennan and Harvey, Mission to the Moon, p. 220.

steadily fallen.

Summarily, NASA, during its earlier years of growth, received overwhelming support as a civilian agency accomplishing scientific results with a secondary emphasis on defense in space. Now, the space agency is being pressured by the Department of Defense and hawkish governmental elements to re-evaluate its original goals and to modify many of its former functions. A lack of any large measure of space activity until just recently, plus the increased pressure from the Department of Defense (another external element), has produced some large scale changes in NASA's growth. Acting as a catalyst, the recessive nature of the national economy over the past few years has aided the tapering and slowing down of NASA's development as a civilian agency.

John Noble Wilford best described NASA's situation in an article in a mid-April, 1968 issue of the New York Times when he said, "After a heady decade of uninterrupted hiring, building and dreaming great dreams of far-reaching exploration, the American /civilian/ space program is gearing down to a slower pace and a less certain future."[12] Perhaps NASA's only means of survival, or at least autonomy, lies with its suppliers or beneficiaries. Downs states that "If a bureau's suppliers (industry) or beneficiaries

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[12]John Noble Wilford, The New York Times, April 16, 1968.

are strong and well organized in comparison to its rivals, then it will probably quickly gain a clearly autonomous position."[13] With this in mind, this study will review in the next chapter the space industry's role in the formulation and continuation of NASA's growth.

The outlook for NASA is questionable for the remainder of the Seventies. Space industry and other NASA supporters are becoming fewer and thus will not be able to bring the space agency back to its former status. NASA's competitor (DOD) is encroaching more and more upon the civilian space agency. Even the press, aerospace industry, and the Pentagon have provided a clear indication that defense spending in space will probably soar in the Seventies. The loser will be NASA, as well as its supporters who have dreamed about future peaceful explorations of space.

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[13]Downs, Inside Bureaucracy, p. 10.

Chapter 4

THE AEROSPACE INDUSTRY: A KEY TO NASA'S DEVELOPMENT

Having previously discussed the role of increased military activity in space, as well as the impact of international events upon NASA's overall growth, a word should be said about a third external factor greatly affecting NASA's development--the aerospace industry. The aerospace industry is particularly important because, as both a supplier and a beneficiary, this industry holds the key to NASA's future growth and development, as well as to its autonomy as a functioning bureau.

In viewing the aerospace industry in an overall perspective, it is one of the largest and most powerful segments of the industrial world. Its position in America's future is best cited by Karl C. Harr, Jr., president of the Aerospace Industries Association. According to Kennan and Harvey, Harr said:

> This industry almost alone is the possessor of of the advanced technology on which the future well being of the nation depends. This is true not only in terms of military security, but also applies to the myriad of other accomplishments that will determine the prestige, power, and economic status

of the United States in the world of tomorrow.[1] Its vastness can best be seen by reviewing lists of numerous aerospace corporations, large and small. These various companies, such as North American Rockwell (North American Aviation prior to 1967), McDonnell, Boeing, Martin-Marietta, etc., and their subdivisions, propose, design, and develop launch systems, space craft, satellites and other technical equipment that NASA utilizes in conducting its exploration of space.

The aerospace industry's political power can be shown by its ability to tie one state, such as California, closer to federal control. Dr. James L. Clayton, Assistant Professor of History at the University of Utah, maintained that, "wages and salaries paid to aerospace employees in California, since World Warr II, had exceeded all state and local public welfare expenditures throughout the entire nation."[2] For the period between 1951 and 1965, "$67.2 billion, or about 20 percent of all DOD prime defense contracts for suppliers, services, and construction, were received in that one state. An additional 5.3 billion was

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[1]Erland A. Kennan and Edmund H. Harvey, Mission to the Moon: A Critical Examination of NASA and the Space Program (New York: William Morrow, 1969), pp. 237-238.

[2]Ibid., p. 241.

spent there by NASA, from 1961 through 1965. This amounted to about 41 percent of NASA's total spending during those years."[3] This is indicative of the impact of the aerospace industry upon the U. S. economy and especially upon the State of California. Many authors relate that this dependence of whole sectors of the economy on government contracts has more or less changed the relationship of government to business. This has been particularly true in the case of the aerospace industry.[4]

The aerospace industry has increased its scope because of the Vietnam War and the space program over the last decade. In the early Sixties the aerospace industry was referred to as an infant industry which was expected to become one of the industrial giants of America. Forbes magazine in 1962 predicted that government expenditures on space would increase from its then $11.6 billion mark

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[3]Ibid.

[4]The aerospace industry was in the process of developing the Super Sonic Transport (SST) when Congress stopped further funding of the project. The program was to fill the gap left in the wake of the Apollo Project as well as being a response to the Soviet's prototype of the SST and the Anglo-French Concorde. With no funding in sight for the SST program the aerospace industry has had to lay off thousands of workers, engineers, and scientists. This drastic set-back culminated with NASA's slow-down, which has contributed heavily to the temporary recession and spiraling unemployment rates across the nation.

to in excess of 20 billion annually by 1970. Although the growth level has not been that spectacular, the industry has still shown impressive gains. Gerson Chanowitz, chief economist for the Aerospace Industries Association, wrote in Aviation Week, July 8, 1968: "The aerospace industry is the largest manufacturing employer in the U. S., with well over 1.4 million people. One in 50 people employed in the nation works for the aerospace industry."

NASA's growth and development has not been as spectacular as that of the aerospace industry. NASA provides only about 30 percent of the business and income that has gone to the thriving aerospace industries. The other major client is the Department of Defense (DOD), NASA's functional and allocational rival in space.

The aerospace industry devotes two-thirds of its effort to the military sector and the remaining one-third to NASA. Consequently, NASA has continued to operate below the level of the military in space. The relationship between the aerospace industry and the military has been closely unified. After Kennedy was elected to the presidency, the industrial contractors and the Air Force lobbied together for a larger portion of the national effort in space. Trade journals were heavily laden with articles favoring the Air Force's position on space policy. Thus, both the Army and the Air Force were being supported by nongovernmental

service organizations and interested trade journals. Because NASA was able to withstand this Air Force-industrial challenge, the space agency demonstrated that it could carry out a program as ambitious as the Apollo Project. Adversely, it revealed to both the Eisenhower and Kennedy administrations, as well as to following administrations, that NASA was not able to win significant support from its industrial constituency. This later proved to be sufficient reason for diminishing NASA's budget even further. For example, during Nixon's term as president in 1968, NASA suffered a large budget cutback of approximately $1 billion. The aerospace industry's response to this sharp cutback was one of ambivalence. Military spending at this time had filled the gap in the aerospace work, and civilian aircraft manufacturing continued to rise to an all time high.

Therefore, NASA depended heavily upon the aerospace industry, as a supplier and a beneficiary, for support, but did not receive that support to sustain growth. As a result, NASA's autonomy will remain in constant jeopardy unless some strong external support

is found.[5] NASA, then, lost a great deal of support from its defense-oriented aerospace suppliers. For this reason, the space agency has undertaken many programs that have had direct military benefits. Hopefully, with more defense spin-offs, NASA's appropriations will increase in order for it to offer more contracts to the aerospace industry. "The problem, however, is that NASA remains threatened of being absorbed by its competitor, the DOD."[6]

One major reason why NASA has lost vital support from the aerospace industry, as compared to aerospace-defense relationships, is that the civilian agency was not able to produce the space "spin-offs" that it had promised. With the exception of teflon frying pans, new bathtub calking compound, as well as other areas in medicine and communications, there were few spin-offs of an industrial nature. Willard F. Rockwell of North American Rockwell

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[5]This may develop only if some external factor emerges in the organization's environment, e.g., increased Soviet activity in space which threatens to supercede the U. S. This may not be forthcoming in the near future after the major upset of the Russians losing three Cosmonauts in a recent flight. The Cosmonauts were sent into space on June 6, 1971, in Soyuz 11 and rendezvoused with their space station (Salyute) which had already been in orbit. They were found dead immediately after their capsule landed.

[6]The Civilian Defense Agency offers a good example of a bureau that was absorbed by its competitor, the Department of Defense. See Downs, Inside Bureaucracy, p. 10.

stated that, "if you want to make money out of any item on the commercial market, you have to spend weeks and months trying to figure out how you're going to get the cost down and then a profit. . . a lot of space stuff is too complicated for civilian use."[7] Therefore, the space program was not able to materialize on its promises of large amounts of technological transfer to the American public. Because of this minimal amount of technology transfer, NASA has begun to deemphasize economic "spin-offs" while at the same time maximizing the increasing benefits accruing from the space program for the military. NASA, then, has been forced into turning to the military for backing and support.

Another reason NASA has been operating below the DOD in space is because of the civilian space agency's patent policies. Probably the most debated provision in the National Aeronautics and Space Administration Act of 1958 has been the one relating to patent policies. "NASA requires that all inventions developed with governmental funds are to be patented by the governmental agency in charge of the program."[8] Defending the principle, NASA states that if the use of public funds leads to an invention, the public should get the benefit without having to give a

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[7]Cited in Kennan and Harvey, Mission to the Moon, p. 248.

[8]The Atomic Energy Commission has a policy very similar to NASA's concerning patentable inventions.

special reward to the private contractor. This policy was prevalent from 1958 up through the early Sixties, but has been changed to allow waivers on some patentable inventions for private use as long as the contractor assures the government free access to them. Nevertheless, the issue of patents is still debated between NASA and its contractors, especially the aerospace industry. "Many times when firms do accept a NASA contract they will not assign their best personnel to work under them if they are denied patent rights."[9] The result has been that many firms seek contracts elsewhere, e.g., the DOD, whichhas a long established policy on liberal patent decisions.

Much of the space industry,and particularly the aerospace industry, would rather accept defense-oriented space contracts because of the liberal patent policies and because DOD contracts often lead to longer production runs of the same item allowing for a higher profit margin.

Many students of the space program question why some defense-oriented aerospace contractors are still anxious to accept contracts with NASA.

One reason may be that companies such as North American Rockwell, McDonnell, and Boeing are manufacturing billions of dollars worth of defense materials annually.

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[9]For further information see Vernon Van Dyke, Pride and Power, the Rationale of the Space Program (Urbana, Ill.: University of Illinois Press, 1964), pp. 219-220.

With such heavy orders for war time equipment they must not overlook the pleasant public image offered by "peaceful" contracts with NASA such as the Apollo Project. These companies do not advertise their work in radar, laser, and nuclear systems. Nor do they advertise their other hardware such as bombers, fighters and submarines. They do, however, advertise in the popular media such things as a two page full color ad dramatizing their efforts in putting a man on the moon.

A second reason that aerospace companies seek NASA contracts is because NASA generally utilizes only specialized units in its programs. This reduces the competitiveness among firms because many of the companies have technical capabilities in select areas. In the Department of Defense, contracts are highly competitive and firms often must take a low profit margin in order to gain a contract.

A third reason companies seek NASA contracts is because there are no penalties for failures. A good example of this was the Apollo 204 fire which killed Grissom, White, and Chaffee. Although North American Aviation was reprimanded, e.g., some projects were canceled, the government absorbed most of the cost.

Still another explanation might be that NASA acts as a large Works Public Administration project. Its space programs need thousands of people. Many persons who were employed in the aerospace industry during World War II and

the Korean War, found work with NASA. Thus, NASA, until recently, has been able to keep aerospace-defense employment at a high level.

Therefore, the aerospace industry is still closely related to NASA's future, but this relationship has been declining. Without the space industry's full support, NASA will continue to be in jeopardy. As a result, NASA has been constantly moving into a trend of more gradual development.

Anthony Downs describes this phenomenon as the "deceleration cycle of bureaus."[10] In this cycle, a bureau may change from a period of rapid growth to a period of static development, which Downs refers to as conserver "dominance." A bureau shifting into this phase of the growth cycle generally reduces its ability to innovate and expand its functions. This can be cited in NASA's recent attempts to deemphasize economic "spin-offs" while pointing out the military benefits of the civilian space program. "Also, the fact that Congress and President Nixon have cut sharply into NASA's budget over the last several years accounts for the organization's desire to defend the present program as much as possible and deemphasize many of the projected

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[10]For further information see Anthony Downs, Inside Bureaucracy, pp. 13-14.

space programs."[11] Furthermore, Downs believes that once a bureau begins to decelerate or experiences an abnormal slowdown over a long period of time, it sets in motion forces that make it decelerate more rapidly.

With NASA's budget cut heavily it must push more for "cost effectiveness" and narrower profit margins for the aerospace industry. With such increased control over industry, firms will make greater efforts to evade such regulations or controls by seeking contracts with DOD, which has been the pattern over the past few years.

With a bare bones budget, NASA cannot achieve the space spectaculars that it once achieved in the Sixties. No longer will the civilian space agency be able to utilize impressive feats to maintain support from Congress and the public. Now that NASA has placed a man on the moon it has only minimal support for further exploration of outer space. As a result, NASA's development has continued to lessen over

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[11] A new project called "Pegasus" has not been openly approved by NASA. Pegasus, a bell shaped rocket transport 114 feet high, is to involve a reusable booster concept capable of delivering Saturn 5 payloads. Its projected use will involve resupplying space stations while in orbit, and possibly transport materials to the moon vehicles to build a base there. It is also projected to be used as a troop transport if modified. See Erland A. Kennan and Edmund Harvey, Mission to the Moon, pp. 251-2.

the decade. Having lost much of its public support and support from Congress, the space agency's budget has dropped to a low level and canceled projects and layoffs are more frequent. No longer will NASA be the prototype of the large scale government management projects because, now that the moon landing has been achieved, new emphasis will be upon the environment, e.g., air pollution. These recent governmental concerns will be approached with the same gusto as NASA met "space."

Therefore, a failure of NASA to maintain its budget and long range space projects, the failure of its economic spin-offs to materialize for industry, and the impending threat of conversion to the military has meant that NASA has fallen short of its main objective as a functioning bureau. That is to say, NASA's security and autonomy are severely threatened and only with future support from exogenous sources in its environment, e.g., the aerospace industry, will NASA remain a viable civilian space agency in the future.

Chapter 5

CONCLUSION: DECLINING REIGN OF THE CIVILIAN SPACE AGENCY

As one of the most unique United States governmental agencies, the National Aeronautics and Space Administration (NASA) has provided students of bureaucracies with many interesting questions concerning the growth dynamics of bureaus. It has been the purpose of this study to elaborate upon several of these questions--namely, Why was NASA able to achieve unusual rapid expansion as a young bureau; and why, after this period of rapid acceleration, did NASA begin to decline? In providing some provisional answers to these questions the author has developed a major hypothesis drawn from a theoretical formulation by Anthony Downs. The hypothesis states that changes in policy, function, and internal structure are a consequence of environmental forces. The author has sought to provide a documented case for the proposition that NASA's rapid growth and subsequent decline during the last decade was a function of large scale changes in external factors.

This documentation has been accomplished by analyzing the impact of certain external variables considered by the author to have been the most important factors affecting NASA's growth pattern. These are: international prestige,

presidential ideology, and other organizations, e.g., the aerospace industry and the Defense Department. Each variable has been analyzed in terms of propositions regarding that variable's impact upon NASA's growth. Findings associated with these propositions have been well documented throughout the text.

Reviewing the relationship between the first two variables, i.e., international prestige and presidential ideology, Chapter 2 demonstrates that both external factors have caused many changes to occur in NASA's growth pattern. For example, during Kennedy's Administration, the space program shifted its major policy advocating a purely scientific program to one promoting technological capability and engineering "spectaculars" in order to increase national interest and international prestige for the United States. This was almost a direct reversal of the policies established by the more conservative Eisenhower Administration. In addition, the study has shown that because NASA was able to achieve impressive space shots and gain international prestige, its status became higher vis-a-vis other bureaus and it was able to obtain unusual increments in appropriations from Congress. Such a shift in policy then--i.e., the switch from a science program to one emphasizing engineering--produced more support for the program and thus allowed it to expand even more readily. This study, thus, has supported the four propositions listed in Chapter 2: (1) The more

the programs of a bureau contribute to national prestige, the higher its status vis-a-vis other bureaus; (2) the higher the status of a bureau, the less it must compete for funds with other bureaus; (3) the less a bureau must compete for funds, the faster it grows; and (4) perceptions of the presidential role may alter the speed with which a bureau grows, i.e., the more conservative the president, the greater the restraint on growth.

Concerning the third variable, i.e., other organizations, this study has found that the role of the Defense Department (DOD) has been very important in determining NASA's development. For example, as the author has discussed in Chapter 3, the DOD has been a constant threat to NASA because it is both a functional and allocational rival of the civilian space agency. This was especially evident during NASA's early years of development because the Army, Navy, and the Air Force wished to take over the space agency's functions of space exploration, but for military purposes. However, the fact that all three segments of the DOD were interested in NASA meant that much interdepartmental rivalry occurred. This was naturally an advantage to NASA as a young bureau because its officials did not have to face a unified threat, but a divided one. This situation more or less confirms the proposition that the greater the number of competitors that seek to absorb the central goals of another agency, the lower the probability that the agency will be

destroyed.

Chapter 3 also discusses the recent challenge of the DOD, primarily the Air Force division. Because of the increased lack of support from Congress and the President, the aerospace industry, and the American public, NASA has become weaker and thus even more fearful of annihilation or absorption by the DOD.[1] This situation has led NASA officials to stress the importance of its program to Congressmen as well as the American public. Pressure tactics such as reference to increased Soviet activity in space have been used. The additional efforts of NASA to stress military benefits accruing from the space program have also been evident. Even the increased emphasis on science has been apparent in the media concerning the Apollo 15 mission to the moon. These facts sustain the other propositions also formulated in Chapter 3. The first states that during periods of growth, agencies resort to imperialism or logrolling in order to survive. The second states that in periods of decline, the more an agency logrolls, the better its capacity to defend its core interests against the imperialism of former rivals.

In Chapter 4 the author has shown the relationship between the aerospace industry and NASA. As discussed in that chapter, the aerospace industry deals mainly in

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[1]For reasons regarding NASA's lack of support see Chapter 2.

contracts with the Defense Department and NASA. Because the aerospace industry has become increasingly disenchanted with NASA, it has developed even closer ties with its much larger customer, the Department of Defense (DOD).[2] This situation is very similar to the one which occurred at the outset of NASA's development. At that time, the aerospace industry developed close relationships with the Army, Navy, and Air Force in their various roles in the space program. When NASA finally became established, the space industry eventually became more dependent upon the space agency, although always maintaining their primary relationship with the DOD. Now, the space industry, dur to the slowdown and other factors, is seeking less contracts with NASA and is becoming even more dependent on the DOD. As a result of the aerospace industry's weakening support for NASA, the space agency has become even more fearful of the military. This has had an enormous effect on the space agency. NASA has responded to this situation by shifting major goals in the organization. For example, a major shift in policy can be seen in the deemphasis of space spectaculars and industrial "spin-offs," e.g., teflon frying pans, to one stressing scientific and military benefits of the space program. The move to increase the scientific aspect of the space program has been evident in the planning of the Apollo 15 mission.

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[2]For more information concerning why the aerospace industry became disenchanted with NASA, see Chapter 4.

By such a shift in policy, NASA hopes to regain full support from Congress and the American public. With this support, the space agency will be able to again expand and offer additional industrial contracts, thus hopefully regaining more support from the aerospace industries. Therefore, in reviewing the relationship between the aerospace industry, the Defense Department, and NASA, this study has found that, first, the greater the number of competitors seeking to absorb an agency, the lower the probability that the suppliers and beneficiaries of that agency will support it. And second, the stronger a bureau's competitors, the less likely the bureau's suppliers and beneficiaries will support that bureau.

This study, then, has provided a detailed analysis of NASA's overall growth and decline since its creation in 1958. Reasons behind the causes of NASA's undulating growth pattern have been examined and found to be related to external forces in the space agency's environment. That is to say that changes in policy, function, and internal structure of NASA have been a consequence of environmental forces. Therefore, we can conclude from this study that NASA's rapid growth and subsequent decline during the last decade was a function of large scale changes in external factors.

Realizing the impact of environmental forces upon NASA's growth and development, this author can perhaps

make some projections as to what will happen to NASA in the future. Although highly speculative, some major changes will need to be forthcoming if NASA is going to survive its present slowdown. Already NASA officials are taking steps to recover the space agency's fallen image among Americans. Increased media coverage of all space shots with special emphasis on their scientific achievements is now being undertaken.[3] Hopefully, according to NASA officials, this scientific base behind the space shots will provide Americans with a more concrete reason to support the expensive space program. This increased emphasis on the scientific aspect of the space program should help NASA regain vital support from Congress and the American public.

Such a revitalization of the space program should also be enhanced by the increased Soviet activity in space. For example, several months ago the Soviets launched Mars-2, which was described by the official Soviet news agency Tass, as being an automatic interplanetary station. Although it was not determined by U. S. authorities whether Mars-2 would attempt a soft landing on Mars, it is known that the vehicle is scheduled to reach the

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[3]The Apollo 15 moon flight is set for July 26, 1971 and is expected to determine whether all the moon craters were created by meteor impact, or whether some are volcanic. David R. Scott, Commander of the flight, has stated that "Apollo 15 will be the most singular scientific expedition ever conducted."

planet by November.

Other Soviet activity includes the permanent manned orbital space station, Salyute. The Russians, however, suffered a major setback in this program when a tiny hole in the wall off Soyuz 11, the spaceship which had docked temporarily with Salyute, caused the deaths of three Soviet Cosmonauts on July 3, 1971. This tragedy will probably have the effect of making future U. S. space shots more interesting because Americans again have become aware of the dangers in manned space flight. Such interest will nonetheless eventually wear off unless the Soviets resume their increased role in space. If this trend should continue, the United States governmental officials may again turn to NASA to meet the Russian challenge in space.

As it now stands, Project Skylab will follow Apollo. Skylab is a three-man earth orbiting laboratory that is more advanced than the present Soviet Salyute station. Future plans include three different three-man crews, flying modified Apollo command ships, to visit this laboratory for periods up to fifty-six days in 1973. They will be conducting scientific, engineering, and medical experiments.

Following Skylab, projections are for a reusable space shuttle called Pegasus, which will fly like an airliner on repeated trips to and from space. But this

program's future is very uncertain. Congress has been increasingly conservative with funds for manned space flight--and the earliest NASA can now hope to have an operational shuttle program is 1978 or 1979.

Therefore, NASA's future rests with the amount of funding it will be able to receive from Congress. Such funding, as in the past, will depend heavily upon large scale changes in external forces, e.g., increased Soviet challenge in space. Congress' support will also depend upon the aerospace industry's willingness to sustain their backing for NASA, as well as the mood of the American public toward future expensive space projects. If NASA is not able to receive support from these sectors in the next five years, the author feels that the civilian space agency will eventually be absorbed by its larger competitor --the Department of Defense. NASA's fear of being absorbed by the military is certainly justified because the Defense Department has desired a larger share of the space program since the civilian agency's creation.

This thesis has examined the major causes behind NASA's rapid growth and subsequent decline since its creation in 1958. From the analysis I have concluded that changes in policy, function, and the internal structure of the space agency are a consequence of changes in external variables--namely, international prestige,

presidential ideology, and other organizations, e.g., the aerospace industry and the Defense Department. I have also made several projections as to what may happen to NASA in the future on the basis of what I have learned from material gathered for the study.

This thesis, however, provides only a starting point for the myriad of subjects relating to the growth dynamics of NASA. Other studies might include a review of basic theoretical propositions outlined by Anthony Downs in his book Inside Bureaucracy, but modified to relate to the space agency. Examples of these propositions are: (1) As NASA grew larger, the average level of talent therein initially rose, and then declined; (2) the rapid growth of NASA's social functions led to a cumulative change in the character of its personnel which tended to accelerate its rate of growth still further; (3) decline or relative stagnation of NASA's social functions has led to a cumulative change in the character of its personnel which has tended to decelerate its growth still further.

Such theoretical propositions as these may be studied by other students of bureaucracies in order to gain a better understanding of not only the growth dynamics of NASA, but of other similar bureaus as well.

Therefore, NASA has provided an interesting study of the internal growth dynamics of a governmental bureau. Its future as a civilian space agency still remains

uncertain, and thus it will continue to be of interest to political scientists and public administrators for some time to come. As it now stands, without further external developments, such as a new Soviet challenge in space, the space agency will not obtain the support needed to keep it alive. If this should result, and NASA becomes an appendage to the Defense Department, its future as a civilian space agency will be bleak, and eventually it will surely die an untimely death.

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APPENDIX

APPENDIX

SELECTED CHRONOLOGY OF MAJOR SPACE EVENTS

1957

Oct. 4	Sputnik I, USSR, first earth satellite.
Nov. 3	Sputnik II, USSR satellite; carried first live dog--Laika.

1958

Jan. 31	Explorer I, U.S. satellite; discovered Van Allen Belt.
Mar. 17	Vanguard I, U.S. satellite; solar powered transmitters.
May 15	Sputnik III, USSR satellite; orbiting geophysical laboratory.
Oct. 1	United States establishes National Aeronautics and Space Administration (NASA).

1959

Sept. 12	Luna II, USSR moon probe; first probe to impact moon.
Oct. 4	Luna III, USSR moon probe; took first photographs of the far side of moon.

1960

Apr. 1	TIROS I, U.S. satellite; first of series of successful meteorological satellites.

Aug. 12	Echo 1, U.S. satellite; a 100 foot diameter balloon in orbit, producing first passive communication satellite.

1961

Apr. 12	Vostok I, USSR satellite; contained Yuri Gagarin, first man to orbit the earth.
May 5	Mercury "Freedom 7," U.S., suborbital flight of Alan B. Shepard, Jr.
July 21	Mercury "Liberty Bell 7," U.S., suborbital flight of Virgil I. Grissom.
Aug. 6-7	Vostok II, USSR satellite; contained Gherman S. Titov; completed 77 orbits.

1962

Feb. 20	Mercury "Friendship 7," U.S. satellite; John H. Glenn, Jr., first U.S. man to orbit the earth.
July 10	Telestar I, U.S. satellite; first commercially financed communications satellite.
Aug. 11-15	Vostok III, USSR satellite; Andrian G. Nikolayev; Vostoks III and IV approached within 3 miles of each other.
Aug. 12-15	Vostok IV, USSR satellite; Pavel R. Popovich.

Oct. 3	Mercury "Sigma 7," U.S. satellite; Walter Schirra, Jr.; first splashdown in detailed re-entry zone.
Dec. 14	Mariner 2, U.S. Venus probe; passed within 22,000 miles of Venus.

63

May 15-16	Mercury "Faith 7," U.S. satellite; L. Gordon Cooper, Jr.; 22 orbits--longest Mercury flight.
June 14-19	Vostok V, USSR satellite; Valery F. Bykovsky; 81 orbits.
June 16-19	Vostok VI, USSR satellite; Valentina V. Tereshkova, first woman in space.

'64

July 28	Ranger 7, U.S. moon probe; photographed face of moon before impact.
Oct. 12	Voskhod I, USSR satellite; first 3-man spacecraft; Vladimir M. Komarov, Konstantin P. Feoktistov, Boris B. Yegorov.

'65

Mar. 18	Voskhod 2, USSR satellite; Pavel I. Belyayev and Alexei A. Leonov; first "walk in space."
Mar. 23	Gemini 3, U.S. satellite; Virgil I. Grissom

and John W. Young; first test of a Gemini spacecraft.

Apr. 23 — Molniya 1A, USSR satellite; first USSR communications satellite.

June 3-7 — Gemini 4, U.S. satellite; James A. McDivitt and Edward H. White II; White performed first U.S. "walk in space."

July 14 — Mariner 4, U.S. Mars probe; launched Nov. 28, 1964; passed within 6,200 miles of Mars.

Aug. 21-29 — Gemini 5, U.S. satellite; Leroy G. Cooper and Charles Conrad, Jr.; completed 120 orbits.

Dec. 4-18 — Gemini 7, U.S. satellite; Frank Borman and James A. Lovell, Jr.; 220 orbits.

Dec. 15-16 — Gemini 6, U.S. satellite; Walter M. Schirra, Jr., and Thomas P. Stafford; first rendezvous in space.

1966

Jan. 31 — Luna IX, USSR lunar probe; first soft landing on moon; transmitted photographs of surface.

Mar. 16-17 — Gemini 8, U.S. satellite; Neil A. Armstrong and David R. Scott; first docking in space with previously launched target vehicle.

Mar. 31	Luna X, USSR lunar probe; first probe to achieve lunar orbit.
May 30	Surveyor 1, U.S. lunar probe; first U.S. probe to soft land on the moon.
July 18-21	Gemini 10, U.S. satellite; John W. Young and Michael Collins; rendezvoused with Gemini 8 target vehicle; first retrieval of a space object (a test package on target vehicle).

1967

Jan. 27	Apollo AS-204, U.S. lunar spacecraft, Roger B. Chaffee, Virgil I. Grissom, and Edward H. White II, killed in flash fire in the spacecraft test center at Cape Canaveral.
Apr. 23	Soyuz I, USSR satellite; Vladimir Komarov killed on April 24 in recovery phase.
Oct. 18	Venera IV, USSR Venus probe; launched June 12; ejected an 884 pound capsule to the surface; returned data on the planet's atmosphere.
Oct. 19	Mariner 5, U.S. Venus probe; launched June 14; passed within 25,000 miles of Venus.
Oct. 26-30	Cosmos 186, 188, USSR satellites; first automatic rendezvous and docking.

Nov. 9	Apollo 4, U.S. satellite; first flight of Saturn V launch vehicle.

1968

Apr. 22	Space rescue treaty signed by 43 nations, including the U.S., U.K., and USSR; provided for international cooperation in emergency assistance to space travelers.
Sept. 15	Zond V, USSR moon probe; first unmanned round trip flight to the moon.
Oct. 11-22	Apollo 7, U.S.; Walter M. Schirra, Jr., Donn F. Eisele, R. Walter Cunningham; first manned test of Apollo command module; first live TV transmissions from orbit.
Oct. 26-30	Soyuz III, USSR, George T. Beregovoi; first manned rendezvous and possible docking by a Soviet cosmonaut.
Dec. 21-27	Apollo 8, U.S.; Frank Borman, James A. Lovell, Jr., William A. Anders; first spacecraft in circumlunar orbit.

1969

Jan. 14-17	Soyuz IV, USSR, Vladamir A. Shatalov; rendezvoused and docked with Soyuz V.
Jan. 15-18	Soyuz V, USSR; Boris V. Volynov, Aleksei S. Yeliseyev, Yevgeny V. Khrunov;

rendezvoused and docked with Soyuz IV.

Mar. 3-13 Apollo 9, U.S.; James A. McDivvitt, David R. Scott, Russell L. Schweikart; first descent to within 9 miles of the moon's surface.

July 16-24 Apollo 11, U.S.; Neil A. Armstrong, Edwin E. Aldrin, Jr.; Michael Collins; first manned landing on the moon.

Oct. 11-16 Soyuz VI, USSR; Geogiy Shonin, Valriy Kabasov; one of three spacecraft and seven men put into earth orbit simultaneously for first time.

Oct. 12-17 SoyuzVII, USSR; Anatoley Filipchenko, Viktor Gorbakov, Vladislav Volkov; part of Soyuz series VI, VII, VIII.

Oct. 13-18 Soyuz VIII, USSR; Vladimir Shatalov, Aleksey Yeliseyev; part of Soyuz series VI, VII, VIII.

Nov. 14-24 Apollo 12, U.S.; Charles Conrad, Jr., Richard F. Gordon, Jr., Alan Bean; second manned lunar landing mission; investigated Surveyor 3 spacecraft.

1970

Apr. 11-17 Apollo 13, U.S.; James A. Lovell, Jr., Fred W. Haise, Jr., John L. Swigert, Jr.; third manned lunar landing, but attempt

was aborted due to malfunctions while the astronauts were on their way to the moon.

June 1-17 — Soyuz IX, USSR; Andreiyan Nikolayez, Vitaly Sevastianov; designed to test man's ability to withstand long periods of weightlessness; 287 orbits.

1971

Jan. 31-Feb. 5 — Apollo 14, U.S.; Alan B. Shepard, Edgar Mitchell, Stuart Roosen, Jr.; performed seismographic tests on the moon.

Apr. 23 — Salyute I, USSR; permanent orbital laboratory.

Apr. 20 — Soyuz X, USSR; Vladamir A. Shatalov, Aleksei S. Yeliseyev, Nikolai Rukavishrikov; rendezvoused and docked with Salyute.

June 9-July 3 — Soyuz XI, USSR; Georgy Dobrovolsky, Vladislav Volkov, Viktor Patsayev; killed during reentry phase.

July 26-Aug. 7 — Apollo 15, U.S.; David R. Scott, Alfred M. Worden, James B. Irvin; lunar landing mission; exploration of moon's terrain.