

From NASA to a National Space Exploration Administration

Arthur M. Hingerty¹
MagLifter Research Consortium, Denver, CO, 80211

The National Aeronautics and Space Administration (NASA) was created by federal legislation known as the National Aeronautics and Space Act of 1958. As NASA turns fifty and begins to carry out nascent national plans for the long-term human exploration of the Moon, many within and outside the space exploration community question the rationale for the back-to-the-Moon effort and the relevance of NASA itself. This uncertain political landscape provides an opportunity to examine the legal foundation of NASA, how this foundation affects the new human space exploration effort, and to address questions regarding the fundamental nature of a national space agency. This essay offers an examination of carrying out a fundamental change in NASA's legal charter so that aeronautics is no longer a responsibility of NASA and that its central purpose is to explore the Solar System with both human crews and robotic systems as a means to advance and aid the establishment of human settlements on our Solar System's planetary bodies as called for by United States national policy.

I. Introduction

In response to the Soviet Union orbiting the first space satellites in the autumn of 1957, the National Aeronautics and Space Administration (NASA) was created by federal legislation known as the National Aeronautics and Space Act of 1958. The "Space Act" was signed into law by president Dwight D. Eisenhower on 29 July 1958, and remains the core statement governing United States civil space activities.¹

As NASA turns fifty, it has been tasked by presidential edict and congressional funding to begin a program of long-term human exploration of the Moon. In a sense, with this direction, NASA is picking up where it left off in 1972 following the last human expedition to the surface of the Moon during the Apollo program. Yet all is not well. Many people within and outside the space exploration community are questioning the rationale for this back-to-the-Moon effort. In addition, there are more than a few voices questioning the relevance of NASA itself^{2,3}. Since that last expedition to the Moon, there has been a steady stream of national commissions, presidential panels, reports, and congressional hearings and testimony studying and recommending what should be the "new direction" for NASA and the American space program. Although some of these reports will be referred to later in this essay, it is sufficient now to say that the recurring nature of these reports, well-meaning and thoughtful as they are, can be viewed as Sisyphean Labors of the Space Age or comparable to Friedrich Nietzsche's "bad infinite of heroic will."

This essay's focus is to examine NASA's fundamental legal charter – the Space Act – and consider how it frames the ongoing debate about NASA's future, how it impedes the progress of space exploration, and how a fundamental change in NASA's purpose, as spelled out in positive law, will be necessary to bring about the much-desired change for the American space program.

II. Goals

The study of government – Political Science 101, if you will – tells us that, unlike the laws of physics, the laws that make up the legal edifice of the contemporary state structure are not set in stone and can be changed, adjusted, and transformed to reflect changing political norms. Frequent "legislative engineering" by the legislative, executive, and judicial branches of governments attest to this concept. As NASA is the subject of the aforementioned studies recommending new directions, its situation may be indicative of systemic problems that cannot be fixed with programmatic makeovers or administrative overhauls. The Space Act was crafted during and for an era identified by geopolitical competition with the Soviet Union and when the craft of aeronautical engineering was in its infancy. As with any entity that is a half-century old – house, corporation, or human being – its health, purpose, and future

¹ President, 4271 Green Court, Member.

direction should be evaluated. In the case of legislation, basic policy evaluation, redirection, and full or partial program termination may be considered.

This essay examines the feasibility of carrying out a fundamental change in NASA's legal charter to achieve two major changes in NASA's purpose:

- 1) aeronautical activities should no longer be the responsibility of NASA; and
- 2) its central purpose should be identified specifically to explore the Solar System with both human crews and robotic systems as a means to advance and aid the establishment of human settlements on our Solar System's planetary bodies as called for by United States policy.

This language may also be a means to mend a fundamental rift within the space exploration community. One of the recurrent themes in the debate about the future of the American space program is the false choice as to whether space should be explored using human crews or robotic systems. Space exploration should be presented as an enterprise that requires the integration of these two complementary means of exploration. With these changes, a more appropriate name for NASA may be in order: the National Space Exploration Administration (NSEA).

As obvious as it may seem, the values on which this essay are based must be stated: Human space exploration and the establishment of off-Earth human settlements in our Solar System are considered worthwhile and valuable enterprises that should be declared goals of United States national policy.

III. Recent Trends in Human Spaceflight

The idea of "reinventing" or "reengineering" NASA has been a prevalent theme of writings and analyses in the space policy field since the end of the Apollo era. Since then, several reports by presidential commissions have outlined broad, sweeping visions for United States space policy. Some of the more prominent of these reports include: the Report of the Space Task Group (1969)⁴, the Paine Report (1986)⁵, the Stafford Report (1991)⁶, and the Aldridge Commission Report (2004)⁷. Although meant to inspire the interested public and present an optimistic belief in a future propelled by robust programs of human space exploration, the vast majority of the elements presented in these reports have not come to fruition. Similar reports and commissions over the years have produced equally disappointing results.

In addition, during the past fifteen years, the commercially driven and grass roots activist "space development community" (also known in some circles as "NewSpace") has developed a cottage industry of criticism directed at NASA's inability to promote or carry out the vision of space exploration.

On a programmatic level, the flight hardware that sustains United States human spaceflight will undergo sweeping changes in the near future. Current plans call for NASA to retire the Space Shuttles in 2010. This retirement will have implications in two areas: access to Earth orbit by American astronauts; and the large cargo flights that support the International Space Station (ISS). The Shuttles will be replaced by the Constellation program consisting of the Orion crew exploration vehicle and its associated Ares launch vehicles. This spaceflight system will transport American astronauts to Earth orbit, the Moon, and, perhaps, Mars. The first earth-orbital flight of the Orion with a crew is expected in the 2015 time frame. If these dates hold true, there will be a five-year gap when the United States will have no indigenous means to send flight crews to Earth orbit and NASA will have to rely on the Russian Soyuz spacecraft to travel to the ISS. Following the Shuttles' retirement, cargo flights to the ISS will be handled by the Russian's Progress vehicle and the European Space Agency's Automated Transfer Vehicle.

Russia's human spaceflight activities consist of transporting crews to and from the ISS with the Soyuz spacecraft. The Soyuz are also used as lifeboats for the ISS crew. Economic uncertainties, turbulent domestic politics, and geopolitical concerns other than their human spaceflight space program will likely compel Russia to remain in its present role for the foreseeable future.

China's human spaceflight program, although embryonic, has completed two successful flights; the first in 2005 followed by the second in 2007, with a third planned for the latter part of 2008. They are moving ahead steadily and the program is being used for the same geopolitical purposes as the early American and Soviet programs. Within ten years their program will in all likelihood be formidable; on par with the later flights of the American Gemini program or even the early, Earth-orbiting Apollo program. The wild card in the Chinese scenario is a lunar flight of a crewed spacecraft – either a lunar circumnavigation or landing. To a great extent, their progress will be dependent on the success of the Earth-orbital flights, large launch vehicle development, and the influence of geopolitical events. In addition, the Chinese have shown an interest in being a member of the ISS program.

To sum up, the trends in human spaceflight activity at the end of the first decade of the twenty-first century indicate that although there will be some major changes (the Shuttle retirement and the Orion spacecraft introduction) and the emergence of a new player (China), it is likely that for the next ten years there will be a consistent level of human spaceflight operations in Earth orbit. However, activity beyond Earth orbit – which should

be described as authentic human space exploration – is unlikely until the 2020 timeframe when Orion-based spacecraft are scheduled to fly to the Moon.

IV. Conditioning Factors and the Political Environment

As with any government agency, NASA's fortunes are affected by a host of factors in the political environment. The foundation for NASA's political environment is the wording of the Space Act. Because this essay proposes major changes in NASA's legal charter, let's examine what the Space Act actually says about NASA's policy and purpose.⁸

Section 102 of the Space Act contains the Declaration of Policy and Purpose: "...it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." It continues that the "general welfare and security of the United States require that adequate provision be made for aeronautical and space activities." The purpose of these aeronautical and space activities are then listed in Section 102 (d) (1-9). These nine "purposes" essentially describe a newly created enterprise charged with the: "...expansion of human knowledge...", the "...improvement of the usefulness, [and] performance...of aeronautical and space vehicles," the "...development and operation of vehicles capable of [operating in] space" and the "...establishment of long-range studies..." The remainder of the purposes deal with cooperation with national defense agencies and other countries, and the preservation of United States leadership in aeronautics and space.

Following the stated purposes of NASA, Section 103 then defines the terms "aeronautical and space activities" in a mix of general and specific phrases. However, the last definition of these activities states: "...and such other activities *as may be required for the exploration of space...*" (emphasis added). Here is the only mention of space exploration in the Space Act.

How NASA is supposed to carry out the purposes of the Space Act is found in Section 203 and is entitled, "Functions of the Administration":

Sec. 203. (a) The Administration, in order to carry out the purpose of this Act, shall --

- (1) plan, direct, and conduct aeronautical and space activities;
- (2) arrange for participation by the scientific community in planning scientific measurements and observations to be made through the use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations;
- (3) provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof;
- (4) seek and encourage, to the maximum extent possible, the fullest commercial use of space; and
- (5) encourage and provide for Federal Government use of commercially provided space services and hardware, consistent with the requirements of the Federal Government.

So here is what we have:

- a "mission statement" (i.e. a policy) is presented;
- the Administration is charged with planning, directing, and conducting aeronautical and space activities;
- a list of purposes for these activities are defined; and
- the means by which the Administration will carry out the purposes of the Space Act are enumerated.

If space exploration is indeed an endeavor the United States wants to carry out, the single phrase, "such other activities as may be required for the exploration of space," gives NASA the opening to explore space. However, the *central purpose* of NASA is not to explore space, but to do all these other things that seem to lead, perhaps eventually, to space exploration. (A case in point: Section 203 of the Space Act was amended with parts (b) (1) and (b) (2) and called for NASA to "initiate, support, and carry out" research associated with, respectively, the Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976, and the Solar Heating and Cooling Demonstration Act of 1974. In military parlance, these amendments can be described as "mission creep." This may have been the first legislative instance of operationalizing the oft-used phrase, "If NASA can land a man on the Moon....")

It is understood that legislation is crafted in general language to provide flexibility when carrying out the law. However, if the central purpose of any legislation is not specifically stated there will be a marked tendency for the legislation's execution to drift from the original intentions and mission creep will become a problem as legislators give in to the temptation to use the legislation as a canvas for dubious political creations. Ultimately, the administrative and operational landscapes of the legislation are hardly recognizable and any outcome can be defined as a success.

A hazard involved in any major legislative overhaul or partial program termination is that the incumbent strength of the law (i.e., a law passed is stronger than a law under consideration) is weakened considerably or absent. When this occurs, the legislation and programs under consideration are open to assault by political interests that are not

sympathetic or that are clearly hostile to the legislation and its programs. NASA would perhaps find itself in a precarious situation, but it is a position that other political interests have found themselves in and survived. A clear purpose for NASA's human spaceflight program has been absent since the end of the Apollo program. The Space Shuttle demonstrated an ability to exploit low-Earth orbit, but its utility was never fulfilled.⁹ The Constellation program has not been welcomed enthusiastically by human spaceflight proponents and its political survivability is by no means guaranteed. At this point in NASA's life, the general nature of NASA's legal charter may very well be an impediment to taking the next step in the evolution of human spaceflight activities.

For clarity's sake, let's review the change to NASA's charter that is being advocated in this essay: NASA's central purpose should be identified *specifically* to explore the Solar System with both human crews and robotic systems as a means to advance and aid the establishment of human settlements on our Solar System's planetary bodies as called for by United States national policy. (As in the Space Act, this policy of "exploration and settlement" can be stated in the Declaration of Policy and Purpose.)

To be sure, this declaration of exploration and settlement is a geopolitical statement and will need to be fine-tuned to reflect any other interests the United States deems important in these matters as decided by Congress and the president. However, it is at its core a geopolitical statement and it may be time for the space exploration community to fully embrace the geopolitical nature of human spaceflight. This author has, in the past, advocated the opposite view:

Though the technology for human spaceflight was advanced during Apollo, the vision [i.e. the vision of human space exploration] was sublimated to the geopolitical forces that gave birth to Apollo. And this is the weakness of the space proponent's strategy. By linking the means of carrying out the vision to volatile geopolitical situations, the space proponents cause the fortunes of the vision to match the ebbs and flows of the geopolitical tide.¹⁰

I am now advancing the idea that if exploration and settlement are stated as United States national policy, human space exploration will be more integrated in the geopolitical environment. In this way, as a more stable element of policy, human space exploration may be less likely to be adversely affected by the geopolitical environment than if it is merely a minor factor added as an afterthought to the geopolitical equation.

V. "A" is for Aeronautics, but not Space Exploration

As the old saying goes, "Remember, the first 'A' in NASA is for aeronautics." And here, perhaps, lies another aspect of the problem. The time is ripe to reexamine this adage and question whether aeronautics should be the responsibility of an organization dealing with space exploration.

Prior to the formation of NASA, aeronautical research was carried out by the National Advisory Committee on Aeronautics (NACA). The Space Act transferred this role to NASA. At the time of NASA's formation, the alignment of the discipline of aeronautics with the infant practice of astronautics was appropriate from both engineering and administrative perspectives. Even though gaining access to and operating in space presented its own unique engineering problems, it made sense to apply aeronautical engineering practices to rockets, missiles, space launch vehicles, and spacecraft and evolve these practices as necessary. Just as the engineering toolbox is similar, the administrative practices in aeronautics, especially in the area of research and development, could also be applied to astronautics. For all the good that came of this arrangement, NASA became an overseer of an engineering enterprise, not an entity charged with carrying out a national policy of space exploration. And now it seems as though no one is happy with the arrangement: aeronautical budgets are negatively affected by resources funneled to human spaceflight; space science must compete with both human spaceflight and aeronautics; and human spaceflight is requesting funds for programs that are poorly justified. As a start to help alleviate this situation, a NACA-like organization should be re-established to continue the vital work of aeronautical research.

If aeronautics is the parent of astronautics, then it is time, to paraphrase and update Konstantin Tsiolkovsky, for astronautics to leave the cradle and depart from the village of its birth.

VI. Projections

The Constitutional Convention of 1787 was convened to fine-tune the Articles of Confederation that were barely managing to hold together the newly formed United States of America. Instead, the delegates took a more radical approach and the result was a constitution, based on ideas generated during the Enlightenment, that set out the legal framework for a new form of government. That document, with amendments, has held together the American experiment in representative democracy for over two hundred twenty years. If the American space program breaks with its past and is charged with a new policy direction and purpose, where might this lead? What would a National Space Exploration Administration accomplish? This is the riskiest part of advocacy, so I will be rather brief, somewhat circumspect, and not offer the utopian visions the space exploration community has a habit of doing.

First, and most obvious, the United States human spaceflight program will have a clearly defined goal. Although broad, the National Space Exploration Administration's main purpose will be *to explore space*. Sometimes the obvious needs to be stated. This is not necessarily the case today.

Second, the United States, as the first nation to state that an element of their national policy is to explore space for the purpose of establishing off-Earth human settlements, would redevelop and strengthen its standing as the world's leader in space activities. All cooperation in space activities between the United States and other nations would be based on this new policy.

Third, a new policy direction would provide the opportunity to demonstrate and carry out the long-promised but never quite fulfilled use of commercial flight hardware and services to carry out various elements of the space exploration enterprise. The new policy is meant to "aid and advance" the establishment of human settlements. The accomplishment of this goal will likely be performed, to a significant degree, by commercial organizations. However, because of the enormous difficulty and risks involved, a binding national policy will be the foundation and driver on which the commercial organizations base their efforts.

Finally, there is one indication the American political system may be ready to take a long, hard look at space activities and provide a means to break with the past. A bill, H.R. 4780, was introduced in the House of Representatives on 18 December 2007, "to enact title 51, United States Code, 'National and Commercial Space Programs', as positive law." When introduced, it was referred to the House Committee on the Judiciary. Its purpose, as stated in Sec. 2 (a), "is to codify certain existing laws related to national and commercial space programs as a positive law title of the United States Code." If enacted, this means that space activities would become, as stated earlier, a stable element of national policy. As written, the bill is a duplicate of the Space Act. However, the bill will likely not be worked on until well after the 2008 elections. Could there be incentives for the House, Senate, and the new president to make fundamental changes, as described in this essay, to the American space program by means of Title 51? As I wrote at the beginning of this section, prophesy is risky business.

VII. Alternative Futures

We could speculate on the many alternative scenarios possible versus the changes recommended in this essay. However, for brevity's sake and to avoid getting bogged down in the "great middle," two straightforward alternatives will be examined.

If the status quo is maintained, human spaceflight programs will continue to proceed at about the pace they do now. They will continue to be unstable elements of national policy that are unduly influenced by national and geopolitical forces. Real or perceived threats in the future could become a driver for a more robust program of human spaceflight, as it was during the Cold War. However, once the geopolitical influence is removed or changed, the human spaceflight program will lose direction and the progress of human space exploration will not have advanced. Maintaining the status quo also protects the institution of NASA from structural and organizational changes. There is great political inertia among organizations and their supporters to protect the institutions and their multitude of interests – NASA is no different.

Another possible alternative is an American space program without the element of human spaceflight. Budget concerns, the lack of justification, and the rise of political interests that are hostile to human space exploration could converge and severely curtail or terminate all American human spaceflight activities. If this scenario came to pass, American astronauts (if such a position even existed) would have to hitch rides on Russian or Chinese spacecraft if they were required to be in Earth orbit. Unlikely? This is, essentially, the situation that will take place in the five years between the time the Space Shuttles retire and the beginning of the Constellation program.

VIII. Conclusion

If NASA continues to operate under the legal charter of the National Aeronautics and Space Act of 1958, the space exploration enterprise will remain in a moribund state without a central purpose. The Space Act provided the United States with a focused means to marshal the necessary resources to access Earth orbit and to learn to operate in that environment during the years of the Cold War. The inclusion of aeronautics in NASA's charter provided engineering and administrative stepping stones to space operations in 1958. However, space operations are no longer a newly created enterprise and a first step in defining a clear purpose for the American space program should be the removal of aeronautical activities and research from NASA's areas of responsibilities. As NASA's offspring, a National Space Exploration Administration's central purpose should be to explore space with humans and robotic systems for the explicit purpose of establishing human settlements on our Solar System's planetary bodies. This explicit purpose, if codified in United States law as the articulation of national policy, will provide the American

space program with a clearly defined goal. A national space agency should be the expression of a nation's belief in an optimistic future and clearly defined space exploration goals are a reflection of that expression.

References

¹NASA History Division, "*Legislative Origins of the National Aeronautics and Space Act of 1958: Proceedings of an Oral History Workshop*," Office of Policy and Plans, NASA Headquarters, Washington, D.C., July 1998, p. 3.

²Gingrich, N., "Space First, NASA Second," *Aviation Week & Space Technology*, Vol. 168, No. 26, 30 June 2008, p. 66.

³Stern, A., "Making NASA Relevant Again," *Aviation Week & Space Technology*, Vol. 168, No. 25, 23 June 2008, p. 78.

⁴Space Task Group, "The Post-Apollo Space Program: Directions for the Future," September 1969.

⁵National Commission on Space, "Pioneering the Space Frontier: The Report of the National Commission on Space," New York: Bantam Books, 1986.

⁶The Synthesis Group, "America at the Threshold: Report of the Synthesis Group on America's Space Exploration Initiative," Washington, D.C.: U.S. Government Printing Office, 1991.

⁷"Report of the President's Commission on Implementation of United States Space Exploration Policy," June 2004.

⁸The National Aeronautics and Space Act, Pub. L. No. 85-568, 72 Stat. 426 (Jul. 29, 1958), As Amended, URL: http://www.nasa.gov/offices/ogc/about/space_act1_prt.htm [cited 14 July 2008].

⁹Pielke, R. A., Jr., and Byerly, R., Jr., "The Space Shuttle Program: 'Performance Versus Promise,' " *Space Policy Alternatives*, edited by R. Byerly, Jr., Westview Press, Boulder, CO, 1992, pp. 223-245.

¹⁰Hingerty, A. M., "Human Space Exploration: Justifications and U.S. Space Policy," *Engineering, Construction, And Operations in SPACE V, Proceedings of the Fifth International Conference on Space '96*, edited by S. W. Johnson, Vol. 1, American Society of Civil Engineers, New York, 1996, pp. 126-132.