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Chapter 17

The Failure of Apollo: NASA's Mistakes—And Ours*

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Abstract

From a slow and behind-the-Soviet-Union beginning, the United States developed three manned space programs: Mercury, Gemini, and Apollo. When the challenge was laid down to place a man on the Moon by the end of 1969, NASA went into high gear and built the Apollo-Saturn system and accomplished the objective. But just three short years later, the manned program for the United States ended, and the United States retrenched into a much more mundane manned program. This chapter discusses how this was allowed to happen and the steps that can be taken to prevent this from happening in the future. The ultimate goal is to start a conversation among those committed to manned spaceflight to build support for a robust program.

I. Introduction

The purpose of this chapter is to start a conversation, a conversation among space aficionados as a group and within us as individuals. We are the believers.

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We are the ones that understand the value of space exploration. We are in the minority. Of course, public opinion polls can be skewed any way the pollster wants (tell me the number you want and I can get it for you), but the polls of public opinion are lukewarm at best. For instance, a poll by the Pew Research Center found that only 18 percent of respondents said that a crewed flight to Mars was a top priority. Even fewer—only 13 percent—said that a manned lunar landing should be. The same poll showed that 22 percent of American said that they had heard “nothing at all” about NASA or private space companies in the past year. Clearly, there is a lot of work to be done.

The conversation we need to have is about how to present space exploration to the public in a way that will garner increased support. I contend that it is the responsibility of all of us, private individuals, corporate organizations, and NASA itself to become more intentional and more hearer focused than we have been in the past. Some may feel that it is not NASA’s responsibility to “market” space exploration, but unless NASA does and does it effectively, funding will dry up given the clamor for public funds by more vocal constituencies.

This chapter explores the mistakes surrounding the Apollo program that prevented the United States from building a robust, manned space program in the twentieth century. The goal is to help define both the problems and to suggest some possible solutions that will inspire the current and next generations to want a greater space effort and thereby provide support for an increased public and private space effort. The failures with which I am concerned are not launch failures or O-ring failures or English/metric measurement failures as might typically be thought but missed opportunities. NASA and we, the space-supporting community, have missed and continue to miss multiple opportunities to build deep and lasting support for an increased space effort.

In this, the year of the fiftieth anniversary of the wildly successful lunar landing, we will center around the Apollo Program as case study. Arguably one of the greatest technological and inspirational achievements in history spanned a little more than a decade and then, as General MacArthur said of old soldiers, “just faded away.”

Up through Thursday, October 3, 1957, there was no real, visible space program. Then, on October 4, Sputnik was placed in orbit by the Soviet Union, and real concern broke out in the United States. The press and Congress reacted noisily. There was a lot of finger pointing, but the Soviet Union took the lead in the space race. The situation worsened one month later when Sputnik 2, a 1,120-pound satellite carrying the dog Laika went into orbit. When the United States finally responded and launched the Vanguard on December 3, the result was a spectacular, televised-to-the-world failure. The satellite, a small three-pound ball,

fell to the ground and lay there beeping. The event was called “Flopnik” and “Kaputnik” and “Stauputnik” in the press. The United States finally achieved orbit on January 3, 1958, with the Explorer 1 satellite and soon President Eisenhower proposed that NASA be established.

The Apollo program was one of the two original manned space programs of NASA. Project Mercury would be a one-man spacecraft that would get the United States into space. The Apollo program would follow with some form of spacecraft that would do something somewhere. Many plans (perhaps better called dreams) had been put forward by, in particular, the US Air Force and the Army both before and after the founding of NASA, but Mercury and Apollo were the two programs that developed lasting support.

As is well known, the lunar program gained its impetus from two speeches by President John F. Kennedy, who brought it directly to the public’s awareness. In a May 1961 speech to Congress regarding critical national priorities, Kennedy proposed that the United States should undertake a program to place a man on the Moon by the end of 1969. The speech was a fairly standard congressional address, and the Moon program was just one of a number of “priorities” that Kennedy felt needed to be addressed. As one of many “priorities,” the proposal was received coolly within Congress and garnered little support from the American people. He gave a reprise of that speech in the Rice University stadium in Houston, Texas, in 1962. This speech focused on the Moon program specifically and was targeted at building support among the American people. The speech drew on the metaphors of the frontier and pioneering and discovery and used flowery prose as opposed to his previous more formal congressional presentation. While not using the term, Kennedy all but stated that it was the nation’s “manifest destiny” to undertake the project and complete the journey. In short, Kennedy told a story, and the speech was highly successful.

The Apollo program itself had begun very modestly in 1960 with just \$100,000 budgeted for technical studies to determine what should follow the Mercury Program. Once NASA had a serious mission (man on the Moon before 1970), once the space race was truly underway with the Soviet Union, spending rose rapidly thirty-thousand-fold to a peak in 1966—and then plummeted. By the time Neil Armstrong and Buzz Aldrin walked on the Moon in 1969, NASA’s overall budget had fallen by 30 percent and spending on the Apollo Project had fallen by 34 percent. By the mid-1970s, following the ASTP (Apollo-Soyuz Test Project), the funding was all gone. The Apollo program itself even ended three flights early, the last three missions having been cancelled due to a lack of interest and a concomitant lack of funding.

From the last flight of Apollo, there was a six-year gap until the first flight of the next manned program, the Space Shuttle. From the last flight of the Space Shuttle in July 2011 until today, there has been another eight-year gap in manned flight by the United States, with, ironically, the United States being forced to purchase a seat on a launcher put into space by the country over which it supposedly had won the space race just to get to the International Space Station.

How could a program that was as spectacularly successful as Apollo not carry NASA forward to new and even greater accomplishments? It was mistakes by NASA and by us, both those who are either inside or outside the space-related companies who care, understand, and value what a vital space program brings to the nation that brought this about. We collectively dropped the ball.

II. What Were NASA's Mistakes?

When we look at NASA's mistakes, we are not looking at mission failures, many of which are well known, but to opportunities that were not pursued that could have changed the level of support for space exploration by the public as well as by Congress and the President who jointly determine funding levels for the agency.

First—The first of NASA's failures was the fact that the Apollo program was marketed to the public that the program would be deemed to have been a success when man walked on the Moon, when the space race with the Soviet Union was won. The date that was set for achieving this goal was by the end of 1969. Apollo 11 accomplished the goal in July 1969—the United States crossed the finish line first and won the space race. So, by NASA's declaration, there was little reason to continue with the expensive Apollo missions.

The original schedule for the Apollo program was for flights through Apollo 20, the last of which was to take place in 1972. That schedule was later stretched out to 1974, five years after NASA said that the project could be called a success, 1969. For most Americans, once a goal is accomplished it is time to move on to attacking other goals. Thus, in the minds of the American public and Congress, the program accomplished its purpose for being well before the program was planned to end. As a result, interest waned and three scheduled missions were cancelled, the three flights that would have yielded the greatest amount of scientific information. As Valerie Neal has said, "The space-race metaphor for human spaceflight held its own demise, for as soon as the race ended in victory there was no further point in continuing to run full speed ahead." A coach who tells his team that the entire season will be a success if they win the game may win the game, but it is all but guaranteed that the team will lose the follow-

ing game. NASA needs to set program goals that extend seamlessly into the following program so that the end point keeps moving out chronologically. Certainly the annual budgeting process by a changing Congress and the program changes resulting from a new President's desire to put his stamp on a mission place difficulties on NASA to accomplish its plans at all, much less in a timely manner, but this is the direction the agency should head.

Second—NASA sold the Space Shuttle to Congress and the people as being nothing more than a prosaic truck, a space truck but a truck none-the-less. NASA made space as routine as commuting to work, something that very few people find exciting or even slightly interesting. The reusable space truck was to make routine access to space possible and later deliveries to the International Space Station would be a normal action of business. In fact, during the proposal stages, the launches into space were to be as many as sixty per year and the cost per launch was to be but a fraction of the cost of an expendable launcher. In all, only 135 launches took place over the thirty-year life of the crewed program with the greatest number of flights in a year being nine in 1985. Needless to say, the costs were dramatically higher than the \$20 million per flight that was put forward in the initial proposals. Final costs per flight were either \$450 million or \$1.6 billion depending on which set of program cost figures is used. The successful flights, by themselves, were great, but the two unsuccessful flights that resulted in the death of fourteen astronauts coupled with the cost cast a permanent pall on the entire space shuttle program.

The sales mantra is to under promise and over deliver. In the case of the space shuttle it was a situation of over promising and under delivering, a fact that the shuttle was unable to overcome.

Third—NASA did not take advantage of what I term the spiritual or transcendent or inspirational aspect of space and space flight. When Apollo 11 landed on the Moon, the most common statement by people around the world was "We did it!" People everywhere were able to identify with not just Armstrong and Aldrin and Collins but with the flight crew and engineers and technicians behind the scenes that made it possible. For the world, it was a great, human accomplishment.

The transcendent aspect of spaceflight to which I refer, an experience, is something quite different from religion, an organization. Transcendence is the recognition that there is something beyond just the material world in which we exist, something that defies measurement. No one speaks of a number of units of love, a cardinal concept that makes no sense, but everyone recognizes love when they experience it, and everyone can speak of love in an ordinal sense. Whereas science deals with the "how" questions, transcendence is more focused on per-

spective and patterns and meaning. It is the transcendent perspective that allows us to derive an answer to the “So what?” question. It is here that ultimate purposes are identified. It is a teleological concept. It was nice to land on the Moon first, but so what? It is nice having a space shuttle but so what? It will be nice to put people on Mars, but so what? There has to be something beyond just the technical challenges if we are to interest the general public. It has to be more than Moon rocks and Martian water.

Astronauts speak of the “overview effect” of seeing the Earth and space from a distance, and people who have never gone into space talk in terms of the “blue marble effect,” the changed perspective gained from seeing photographs showing the entirety of Earth with all its colors against the background of black space. Add in the awe that is created by viewing photographs taken by the Hubble Space Telescope, and you have a set of very solid resources that can be used in speaking to others. Space has an inspirational effect on people when properly presented, and NASA needs to remember this with every publication and announcement to the general public. Keep producing the technical reports for the scientific community but remember that most of the world is different.

The final aspect of the transcendent focus of space flight was the entire space race of the last century which positioned the race as a conflict between the United States and the evil empire, the “Godless communists.” By positioning the Soviet Union as “God-less,” the United States, by default if nothing else, placed God on our side (yes, this is the wrong direction for a proper relationship: it should be that we are on God’s side). By making the space race a religious quest, a level of fervor was built that gave credibility to our efforts.

Fourth—space was and often continues to be discussed and sold through language that appeals to scientists and engineers, not typical citizens. NASA—and we—have to remember in all communications that *you* don’t sell, *people* buy. It doesn’t matter how wonderful you believe your product to be, unless the potential buyer sees a need for what you are offering, no transaction will take place.

Most people are not scientists or engineers nor are they poets or essay writers, but everyone loves a good story. Reports constructed in story form (short story given the diminished attention span of most Americans) can capture the imaginations of people and cause them to dream.

Example: When the oxygen tank exploded and caused a real emergency for Apollo 13, Jack Swigert’s words communicated to Mission Control were, “Okay Houston, we’ve had a problem here.” But, when Tom Hanks says the line in the movie, he says, “Houston, we have a problem.” Fewer words, present tense, active. The message was also moved from the Command Module Pilot to the mouth

of Mission Commander, Jim Lovell who was played by the lead actor, Tom Hanks.

William Faulkner was one of the master storytellers of the twentieth century. When he was confronted by a reporter with conflicting statements he had made about his past, Faulkner said, “My job is to tell the truth. When I need a fact, I make it up.” We in the scientific community can’t play loose with the facts in our scientific reports—nor can we mis-state facts to the public, but we can remember that communicating the truth of what we believe about the space program should not be simply a listing of facts but a statement of human impact—the “so what? question. We need to identify real benefits that affect the lives of Americans. By and large, when the general public is asked what has come out of the space program, their frequent answer is Tang, the powdered orange drink that was neither developed by nor for NASA. NASA has produced a long list of benefits that have come from space exploration. They and we need to choose from the list the benefits that will most closely apply to our listeners and be certain they are said—and heard. And we must remember that learning of benefits for the individual will carry much more weight than will learning of benefits to society as a whole.

David Meerman Scott, author of a number of books about marketing, declares that

It’s always about storytelling. The best marketers on the planet are able to tell stories, and that’s what’s important for space travel going forward. [We] need to rekindle [the] imagination. We need to tell the story of why we should be investing in this. There’s still potential for that kind of story.

In telling the story, we have to follow the rule that I teach—If you can’t explain something to a ten year old or to your grandmother, you don’t understand it and you can’t sell it. That does not imply that we need to “dumb-it-down.” There are few people with more wisdom than grandmothers, and children can see through false statements as if by magic, so the intelligence of our audience must be respected.

If more proof is needed about the critical importance of storytelling, it is reported (in the Gospel of Luke) that the first public statement by Jesus was a speech about theology to his hometown friends and neighbors. The result of that speech? The people of his hometown tried to kill Him. He quickly switched to telling stories, and people flocked from miles away to listen to his talks.

III. What Were and Are Our Mistakes?

First, we have fallen prey to the “but those were special times” mantra. Then was the height of the Cold War, but today is the height of private investment in space. Then was just the United States and the Soviet Union. Today, you also have India and Japan and a very determined China that would like nothing better than to beat the United States to a manned landing on the Moon. Then, all space work was directed by public agencies. Today, there are entrepreneurs such as Elon Musk and Jeff Bezos and Richard Branson and Hu Zhenyu, CEO of the Chinese company LinkSpace. These times are rich with at least as much potential as the 1960s. These, too, are special times. Every time is a special time with its own unique opportunities.

Second, we believe that the United States and the Soviet Union just poured money into the programs then but spending today on space is as great as spending then, and it is done by a much broader set of funders. In addition to the United States (\$22 billion) and spending by Russia (\$3.3 billion), there is spending by China (\$8.4 billion), the European Space Agency (ESA—\$ 6.4 billion, Germany (\$4.3 billion), France, (\$2.7 billion), in addition to the solidly funded programs of the Indian Space Research Organization (ISRO), Japan Aerospace Exploration Agency (JAXA), et al.

In addition to government spending, there is a significant level of private spending on space. SpaceX, Blue Origin, Virgin Galactic, Orbital ATK, and publicly held companies, including Boeing and Lockheed Martin, are but a few major operators. Add to this the plethora of companies around the world that are involved in space, and there is a real foundation for a major space effort.

During the presumed “golden age” of space, you first had to build infrastructure—e.g., ground facilities and a tracking network, and design rockets for the first time before a robust program could be in place. Today, infrastructure exists around the world and the fundamentals of launchers and satellite construction are widely known. Then you had to learn how to rendezvous. Today rendezvous and docking are routine activities.

Then, missions required more resources. Today, with the knowledge already acquired, less support is required for missions. As an example of the latter, the following table shows the number of US Navy ships that were assigned for rescue and support of selected Mercury, Gemini, and Apollo missions. Naval support for one Gemini flight cost \$32 million in 1965 dollars, a figure equal to \$224 million in today’s funds.

Spaceflight	Number of Assigned US Navy Ships
MA-6 (Glenn's orbital flight)	34
Gemini 12 (last flight)	11
Apollo 11 (lunar landing)	8
Apollo 17 (final Apollo flight)	4

Finally, we remember with fond respect—and no little awe—the giants of the early Space Age, Wernher von Braun and Sergei Korolev, and wistfully hope for the arrival of another Moses to lead us out of the wilderness. That, of course, would be nice, but today there are two, thirty-five-year-olds in each space organization ready and waiting to be unleashed, and if we as managers don't know who they are, shame on us!

During the space race, many of the engineers and scientists were recent college graduates. The average age of the staff in the Mission Control Room was twenty-six. Gene Kranz, Chief Flight Director, was thirty-five when Apollo 11 landed on the Moon. In general, the engineers and scientists were better educated than their managers who often were career military personnel. The managers were smart enough to give their staff the freedom to do the job. Failures along the way were considered to be part of the learning process. Failures on *outcomes*, however, were not tolerated. In a CIPP (Context-Input-Process-Product) evaluation model the focus was on Product—outputs. The path that was taken and the resources used to obtain the result were recorded so successful outcomes could be repeated and failures could be avoided.

Just as every manager—at any level—should have a succession plan in place, managers should be scouting their staffs for the undiscovered potential stars and encouraging their development. All too often, managers who have an outstanding staff member and a very poorly functioning staff member focus their time on helping the weaker staff member to improve, believing that the really good person did not need assistance. That may be correct from the employee's position, but from an organizational perspective you should invest your time and resources in building your top staff members for their next challenge. It has been said that employees don't leave companies, they leave managers, and the way to keep an employee engaged—and employed—at a company is to pay attention to and encourage him or her along the way.

For both NASA and us as we try to “market” space to a skeptical audience:

Action 1

We have to think and talk from the hearer's perspective, not our own. Whereas we are enamored by technical wizardry and managerial accomplish-

ments, most of the American public could care less about these. We need to talk of real benefits that affect the lives individuals every day.

We need to use language and idioms that will resonate with our intended audience today. An example is a church in the Washington, DC, region that was founded by a twenty-six-year-old pastor. Through a great deal of hard work—and targeted marketing—it is growing rapidly and reaching Millennials who, we are often told, have turned their backs on the church. This pastor recently reached his thirtieth birthday. Even though he founded the church, he is no longer allowed to make decisions about what to give visitors because he is “too old.” (This reminds one of the “don’t trust anyone over thirty” mantra of the 1960s. Incidentally, the phrase was coined by Jack Weinberg, who is now seventy-nine.) Speaking the language of the people and the times is essential for building the support needed.

Action 2

We all need an elevator speech, a short, prepared-in-advance speech that explains what your organization does, clearly and succinctly. An elevator speech is a speech that is perhaps thirty seconds long that is designed to create interest in the hearer in your organization, what you do, or space specifically whichever will reach people most effectively.

Action 3

We all need to think in terms of marketing, continuous marketing, of the benefits of space exploration. In discussing how best to market the space program, Ozgur Gortuna begins with the traditional “Four Ps of Marketing,” Price, Product, Promotion, and Physical Distribution,” and then adds Philosophy. He notes that “Embracing the philosophical rationale for space exploration can be particularly useful in better communicating the benefits of space activities and creating a sustainable base of public support.” When pastors and priests and missionaries “sell” the faith, they don’t talk theology but benefits, whether a happier life today or heaven in the future, whether God’s pleasure in the person or aiding an impoverished person to survive, it is benefits that the person will receive by adhering to the faith being promulgated that are the focus.

Action 4

Finally, it would be wise to read and think about the ideas put forward in two books, *Tipping Point: How Little Things Make a Big Difference* by Malcolm Gladwell, and *Houston, We Have a Narrative* by Randy Olson.

Gladwell strongly advocates that you harness the power of social networks. Written before the social network phenomenon took flight, Gladwell showed the power of networks to spread ideas, sell goods, and influence society. His book puts forward three fundamental aspects that should be taken to heart.

The first element is what Gladwell calls “The Law of the Few.” This is a variation of the old eighty-twenty rule that says that 80 percent of anything is done by 20 percent of the people. This is true in work settings and in building communities. Gladwell identifies three types of people who are “the few,” Connectors, Mavens, and Salesmen.

Connectors—Connectors are people who have many friends and acquaintances, links to other people. These are people who are trusted and who link to a large number of others. They span a number of worlds and, according to Gladwell, have a combination of “curiosity, self-confidence, sociability, and energy.” Gladwell talks about the “six degrees of separation” concept, that each person is connected to every other person by just six people, so convincing a Connector of the value of space can spread the message widely and quickly.

Mavens—Mavens are information specialists, people who intentionally make connections with a wider audience. By choosing what to pass on, by serving as information brokers, they influence peoples’ thinking. Identifying and then providing these Mavens with the right message will assure that the proper perspective will be spread.

Salesmen—Salesmen are the persuaders. Regardless of the message, they have the ability to sell. As examples we have two very different people with very different styles—Ronald Reagan and Bill Clinton. Both had the ability to sell ideas and convince people. Because of this they are likely to be remembered long after George Bush and Barack Obama have become footnotes on the pages of history. We need to identify and utilize people with this gift both at the national and the local, level so the message will be enthusiastically be put forward.

Gladwell’s second element is what he terms “The Stickiness Factor.” The stickiness factor is hard to define but easy to recognize. Gladwell defines the Stickiness Factor as the quality that compels people to pay close, sustained attention to a product, concept, or idea. Stickiness is hard to define, and its presence or absence often depends heavily on context. Often, the way that the Stickiness Factor is generated is unconventional, unexpected, and contrary to received wisdom. This requires careful attention and a honing of our message, mostly through attentive trial and error.

Finally, Gladwell speaks about “The Power of Context.” Certain small groups are ready to hear a message. The place and audience of first introduction of an idea is important so our audience must be understood and our message must

be carefully honed. The use of test marketing and focus groups off-line will allow us to hone our message before we present it to the wider audience. The importance of this in building for the future was recently confirmed by a very different group than aerospace experts, stand-up comedians. In past years, stand-up comedians tried out their material in small clubs in cities away from their main markets. Jokes and lines that worked were kept in the act, those that didn't were cut. Today they bemoan the fact that everyone carries a smart phone and can record and put on YouTube the material that didn't work. Honing their "message" has required new thinking—as it does for us.

Randy Olson's basic tenet is that scientific presentations and writing should focus around telling stories. Olson states that most scientific writing is of the I-M-R-A-D variety (Introduction [I]—Methods [M]—Results [R]—And [A]—Discussion [D]). Included is the listing of facts, a listing of steps taken, and a listing of findings. The result of this style is a stilted, boring paper or presentation. Olson puts forward the A-B-T approach (And [A] But [B] Therefore [T]) in which facts are presented sequentially (____ and ____ and ____), then a conflict or contradiction or problem is introduced (____ but ____) followed by a resolution (therefore ____) This structure for telling the story of space will engage the brain of the hearer or reader and draw him or her forward to the conclusion that is desired by the author. The A-B-T method of telling the story of space will help us to better communicate the wonder and awe and, yes, the facts of space in a way that will engage our audience and lead them to *want* a larger space effort.

IV. In Partial Summary, In Conversation Start

We have to stop talking to ourselves and talk to others in ways they can receive the message. We have to think with our minds but see with their eyes. We have to use our understanding but speak their language. If we can make this a way of life for us, we can change the future.

I said in my introduction that this was to be an opening of a discussion. I hope we will remember the goals put forward and begin to talk, to others and with ourselves so we can build a vibrant future for space exploration.

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