

Making Space for Everyone

The story of how NASA came to see the public as instrumental in accomplishing its mission provides insights for R&D agencies trying to create societal value, relevance, and connection.

The tenor of spaceflight has changed. In the spring of 2020, the gloom of COVID-19 was temporarily dispelled by two NASA astronauts donning restyled flight suits before launching aboard Space X's Dragon capsule—the first time the agency's space travelers have left US soil in a non-NASA launch vehicle. Then, within the span of nine days in July 2021, billionaires Richard Branson and Jeff Bezos rode to the edge of space inside vehicles they financed. In September, Dragon lofted four civilians into Earth orbit for a three-day sojourn around the planet. Underwritten by Jared Isaacman (yes, another billionaire), the voyage included three people he'd selected to accompany him as part of an effort to raise millions of dollars for St. Jude Children's Research Hospital. Being a space traveler, formerly the domain of military test pilots and scientists, has very quickly become not exactly democratized but certainly open to more people, the harbinger of a future where space could be for everyone.

In one sense, the involvement of wealthy patrons and private companies in space activities harkens back to a time when industrialists and philanthropists funded astronomical observatories. In another sense, however, the combination of public involvement and entrepreneurial ferment is an outgrowth of NASA's commitment to public engagement over the last 60-plus years, which began with the agency seeking to show the world its wondrous achievements and value. This has included making people feel like—and eventually become—a part of the action.

After World War II, government organizations and

the US military were eager to harness the power of rockets to understand the properties of the atmosphere as well as to explore nearby space for defense and communications purposes. In 1958, President Eisenhower stood up NASA to advance science and space applications and provide benefits of space to human society—starting the flow of a stream of civilian government funds to the agency. After 1961, when President Kennedy committed to sending humans to the moon's surface ahead of the Soviet Union, funding to the agency increased until it reached 4.4% of the total federal budget in 1966. At that time, the federal government, along with collaborators in the aerospace industry and universities, was firmly at the helm of US space activity.

This government-centric version of well-funded spaceflight is now regarded as the baseline norm by everyone, from science museums to pundits proposing "moonshots" in a variety of techno-scientific fields. But in reality, NASA has strived to engage many publics with its work. Over the years, the agency has continuously redefined and retooled its approach to engaging various publics amid social, cultural, legal, and technological changes. NASA's efforts were never centralized or perfect, but they were driven by passionate and creative individuals scattered across the organization. As a science and technology studies scholar and a space policy and program practitioner for more than two decades, I believe R&D agencies can reflect on these decisions and their outcomes to understand how strategic and meaningful public

engagement can be integral to realizing the value and relevance of federally funded science and technology programs.

Early NASA public relations

Over NASA's six decades, Americans outside of government, academia, and aerospace have played integral roles in spaceflight—although their earliest functions were not direct or participatory. From the agency's start, the US Congress directed it to ensure “the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.” Policymakers wanted to promote the open exchange of information from space research programs among the world's scientists and to put American technological prowess on display on the world stage, but they were equally concerned with legitimizing the space program in the eyes of American citizens. A glance at the directive's legislative history shows that its originators believed public understanding was essential to marshaling support to make the space program successful.

NASA immediately created a public information office that formed close relationships with the news media of the time. The media were invited to cover launches while offering access to the astronauts as well as the scientists and facilities working on missions to the moon and planets. The agency directly communicated its plans and accomplishments by way of posters, pamphlets, publications, movies, speeches, public tours of NASA facilities, and traveling exhibits packed with models and scientific demonstrations. By associating the space program with discovery, economic vitality, and national preeminence, the endeavor gained the support of various audiences including businessmen, housewives, students, and children. Rhetorically, the agency promoted the idea that citizens were “sharing the adventure” even though most remained in passive, consumptive roles. By doing so, NASA sought to create what political scientist Yaron Ezrahi calls an *attestive public* to legitimize the agency's actions and authority.

Although watching launches on television elated and inspired many Americans, NASA never managed to create a consensus of public supporters for the moon landings. By the time Apollo 11 arrived on the lunar surface in 1969, opinion polls were divided on the value of the program. Millions opposed the program, believing it a waste of resources and seeing the all-white, all-male crew as unrepresentative of America's diversity, disconnected from societal concerns during a time marked by marches for civil rights, equal opportunities, and an end to war. Moreover, by then,

the costly impacts of chemical weapons, pesticides, and other techno-scientific creations were becoming evident, and social activists and scholars began to question the propriety of leaving choices to scientific experts and technocrats. NASA had to cut the last three planned Apollo missions as Congress' appetite for funding lunar jaunts fell. Remaining relevant would require NASA to rethink the roles of citizens as solely passive consumers of techno-scientific information and develop pathways to give them more meaningful roles in the space program.

Embracing public engagement

In the 1970s, as NASA shifted from the Apollo program to the space shuttle program, the agency began to reframe its relationships with those outside of the traditional set of space program actors. Agency officials could not ignore the fact that any new human spaceflight activities would need to fit with the social and political environment of the time. Consequently, they sold the shuttle to President Nixon, the Congress, and the American public with a new socio-technical vision for spaceflight—one that would make space accessible and beneficial to a wide variety of people through the new vehicle. Putting that vision into practice meant recognizing more segments of the American public as resources critical to the program's viability and giving them opportunities to play more participatory roles in the program. It's no accident that the shuttle's popular approval numbers were higher than Apollo's.

Over the decades since, NASA's approaches to connecting with citizens have evolved with the introduction of new information and communications technologies, social change, legal developments, scientific progress, and external trends in space activities and public engagement. The result has been an increasing and increasingly accessible set of opportunities that have enabled diverse segments of society to connect more closely with NASA's work and, in turn, boost the agency's techno-scientific and societal value.

On the most basic level, NASA has sought to enhance accessibility of information and opportunities to make people feel like participants in spaceflight, even if not as contributors to the cause. That is engagement enough for many people, who have been able to see space hardware up close through NASA's 10 visitor centers plus affiliated museums and science centers and touring exhibits. NASA has provided students with the chance to talk with astronauts in space while making scientists and engineers available to answer questions about space telescopes and life in the universe. By teaming with toymakers like LEGO and American Girl, NASA has enabled children to indulge in imaginative space-related play. Meanwhile, tapping into social media has allowed the agency to communicate freely and directly with the public, rather than relying on the news media.

But some of the more interesting shifts in public engagement have to do with expanding who participates in space activities directly. One of the ways NASA has done this is by diversifying its workforce—most notably, its astronauts. In the early years of the program, the astronaut corps consisted only of white men who had been military test pilots. The rationale was that this group had already undergone extensive physical and psychological screenings; the problem was that this requirement, for the most part, excluded women and non-whites, who lacked access to the engineering education and experience with high-performance aircraft operations NASA required. As the civil rights and women’s movements progressed in the late 1960s, NASA felt pressure to change its hiring practices, providing more opportunities for women and people of color to join its ranks, including the astronaut corps.

NASA invited still more diverse groups to ride aboard the space shuttle. The agency changed its recruiting strategy to include scientists, engineers, and medical doctors to perform in-flight experiments and mission

fees to payload owners, NASA has instead offered grants, primarily to the university community, for competitively selected research projects in space science. The agency also invites various groups to propose experiments and technology development projects through government-wide programs such as the Small Business Innovative Research program, which aims to foster innovation in small businesses, as well as the Established Program to Stimulate Competitive Research (better known by its EPSCoR acronym), which seeks to enhance research infrastructure and competitiveness at the state level.

Like other federal agencies, NASA has also tapped into the ingenuity of Americans and individuals worldwide through prize competitions, challenges, and crowdsourcing projects—conducting 400 overall to date. These open innovation efforts have sought solutions to technical problems, such as storing and distributing power on the moon and creating an app for astronauts to accurately monitor their food intake

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operations. Recognizing the shuttle’s diplomatic and economic value, NASA welcomed representatives from other countries as well as from corporations interested in putting payloads on the vehicle. Soon, the agency started down the path of flying “ordinary citizens” aboard the shuttle, beginning with teacher Christa McAuliffe. After McAuliffe perished along with the other members of the Challenger crew in 1986, NASA terminated the program, but students and other members of the public sent letters to the agency expressing their support for the teacher-in-space program and human spaceflight.

Another significant change in public engagement practices has been providing more people with opportunities to do space-related R&D. Through the shuttle program, the agency enabled companies, universities, high schools, and an eclectic set of participants ranging from artists to garden seed companies to develop and fly payloads. The stated purpose was to advance knowledge of the effects of the space environment—a concept that was sometimes loosely defined.

Today NASA similarly encourages a broad set of players to use the International Space Station (ISS) for R&D. While some of the shuttle and ISS programs have charged

in space. In addition to helping NASA solve perplexing problems, these approaches also foster and illuminate new sources of talent and spur the growth of companies that often go on to win NASA contracts and meet other national needs.

Likewise, dozens of NASA citizen science initiatives now bring millions of people directly into the excitement of scientific discovery. NASA’s Globe Observer project, for example, solicits environmental observations from people around the world to help researchers better understand mosquito habitats, global cloud cover, and more. Backyard Worlds: Planet 9 invites the public to comb through space telescope data to help find new planets and brown dwarfs at the edge of the solar system. Involving everyone from amateur astronomers to retirees, citizen science projects treat their participants as extensions of research teams, recognizing notable contributors as authors on journal articles that announce new findings.

Sometimes the agency seeks ideas from members of the public, a leading example being for names of spacecraft. NASA has turned to students to select names for a space shuttle orbiter and Mars-bound

rovers through nationwide competitions, giving young people the opportunity to research and write about meaningful names and contribute palpably to a mission. These efforts give contributors a sense of ownership, but they can sometimes require special care from the agency. A public vote to name an ISS module garnered a majority vote for “Colbert” after late-night TV host Stephen Colbert persuaded his viewers to write in his name. NASA was looking for something a bit more majestic but went along with the fun and renamed a part of the ISS gym after the host: the Combined Operational Load Bearing External Resistance Treadmill (COLBERT).

More substantively, NASA and space policymakers have occasionally conducted town hall meetings to gather public perspectives on the future of the space program, the first of which was commissioned by the White House and Congress in the mid-1980s. The inputs received at these meetings have not explicitly changed the direction of space activity—but they have served as direct outreach, validating the agency’s mix of human and robotic missions supporting space exploration, Earth science research, and economic and technological goals.

In 2014, by partnering with the Expert and Citizen Assessment of Science and Technology network, NASA convened deliberations among demographically diverse members of the public about how to mitigate the impacts of an asteroid headed toward Earth and how to go about human exploration of asteroids. These thoughtful discussions gave NASA a sense that the public prioritized values such as trust, safety, and cost when they talked about how to approach these challenges. Feedback from the participants indicated they appreciated and felt empowered by being able to discuss these issues.

Taking everyone with you

In a democracy, federal techno-scientific agencies have tough jobs. Established to fulfill lofty goals, whether national security or public health or economic prosperity, they must constantly make decisions about the development, use, control, and stewardship of research and technology development in the face of limited budgets, potential risks, and political pressures. At the same time, they must demonstrate value, accountability, and legitimacy. For these agencies, serving the public good may mean striving to placate millions of people and many constituencies whose opinions and desires are far from harmonious.

Public engagement is, in a sense, a way for agencies to mediate these varied needs, but it takes a great

deal of energy, creativity, and political savvy. It requires a willingness to understand and accept audiences of all ages and backgrounds—enthusiasts and naysayers alike. It also entails understanding that engagement can mean giving up some control and trusting that listening to others can help and enhance your work. Importantly, the organization must see value in expending resources to take a path that trades efficiency for the ability to include those it is mandated to serve.

Over time, NASA has invited the public into its work in ways that have allowed people to feel like—and in many ways become—part of the adventure of space exploration. The path has not always been smooth: early on, engineers argued with public affairs officials over the value of adding cameras to the Apollo lunar lander because they would add weight to the spacecraft and potentially displace other critical instruments. Even today, the agency has yet to employ citizen science projects and public technology development competitions to meet its R&D needs on the scale on which it uses innovation tools such as grants and contracts.

Given these differences and the difficulties of orchestrating activities across NASA’s disparate offices, the agency has never subscribed to a single strategy for engaging the public in its work. Over time, progress has come from dedicated individuals and organizations who have recognized the opportunities to connect with and show value to the nation’s people. This commitment, I believe, has been the linchpin of NASA’s ability to stay relevant for six decades.

At NASA, the challenge of making space for everyone will continue, particularly now that the public is watching billionaires launch themselves into space. Inevitably, the agency will face questions about the value of the federal mission when the private sector is achieving similar feats. But government agencies have important roles to play in pioneering R&D of the sort that companies do not dare to pursue. And these agencies need to keep the public involved—not just to understand the progress they are making but to help shape important outcomes for society. If designed thoughtfully, such initiatives will serve the needs of government institutions, participants, and society alike as they support the democratization of techno-scientific endeavors.

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