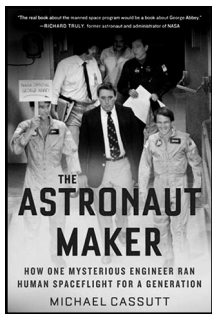


GEORGE ABBEY: THE ASTRONAUT MAKER— HOW ONE MYSTERIOUS ENGINEER RAN HUMAN SPACEFLIGHT FOR A GENERATION



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Starting in the mid-1970s, NASA began gearing up to return humans to space after the termination of the Apollo program. In 1977, while still a freshman in high school, I remember being captivated while watching the Approach and Landing Tests on television. These ALTs were conducted as part of the new Space Shuttle program and were a series of unpowered test flights of the winged orbiter *Enterprise*, named after the starship that appeared on the television series *Star Trek*. Each ALT involved ferrying the massive orbiter piggyback atop a modified Boeing 747 to altitude and then releasing it. Crews of two astronauts then flew the unpowered vehicle through a series of maneuvers over the massive dry lakebed at Edwards Air Force Base, California. These flights replicated the final approach that the orbiter would take in order to test its overall flight characteristics during the final moments of an actual Space Shuttle mission.

Each time *Enterprise* touched down and the wheels of its landing gear rolled to a stop, an armada of support vehicles approached the waiting orbiter. These included a pickup truck equipped with a stairway, similar to what some commercial airliners still use today to allow passengers to board and exit an aircraft.

When the astronauts emerged onto this stairway, the first person to greet them was a stocky-looking man in a dark blue flightsuit, his raven hair trimmed in a military crew cut. After STS-1 embarked on its first flight into space four years later, followed by subsequent flights that would establish the Space Shuttle *Columbia* as the world's first truly reusable spacecraft, this same man would be seen escorting astronauts to the launch pad as well as greeting them upon their safe return from space. From liftoff to landing, this man seemed to be everywhere that the astronauts were, but who was he?

George William Samuel Abbey helped shape our country's space program and those astronauts who served in it. During his decades-long service that peaked during the Space Shuttle program, Abbey helped our nation win the Space Race with the former Soviet Union. He then went on to become a key player in a post-Cold War effort that eventually led both the US and the former Soviet Union to help build the *International Space Station*. Author Michael Cassutt in his new book *The Astronaut Maker* seeks to separate man from myth in a revealing account of this seldom-understood individual.

After growing up in Seattle, Abbey attended the US Naval Academy and, upon graduation, switched to the Air Force because it was a quicker path to his first love—flying. Skilled in piloting both fixed-wing aircraft and helicopters, Abbey went on to earn a master's degree in electrical engineering and after graduation, he was assigned as a technical liaison with Boeing to work on the Dyna-Soar program. Shortly after the X-20 program was canceled, he was detailed to NASA.

In 1964, Abbey began his civil service career at NASA's newly formed Manned Spacecraft Center in Houston. He started as an engineer and finished as a center director, with many stops in between.

Abbey's early duties at NASA involved monitoring the work being done on the Apollo Block II spacecraft. He would roam the buildings of the massive North American plant in Downey, California, asking questions and taking copious notes. From these he compiled detailed reports that showed not only an in-depth understanding of the hardware, but the entire Apollo program as well. His reports soon got the attention of upper management.

Among the space agency's senior management, Cassutt notes that Chris Kraft, Bob Gilruth, Joe Shea, and George Low were among those within NASA that influenced Abbey the most. In comparing their personalities Cassutt astutely notes that, "Gilruth was loved, Shea was admired, Kraft was feared, but George Low was revered."¹

Joe Shea was originally the head of the Apollo spacecraft program office. However, as a result of changes in management that occurred in the wake of the *Apollo 1* fire, Bob Gilruth, director of the Manned Spacecraft Center, relieved Shea and replaced him with

George Low.

A brilliant engineer as well as a gifted manager, George Low joined the Lewis Research Center in 1950 after graduating from Rensselaer Polytechnic Institute. In 1958, he helped lead the transition from the National Advisory Committee of Aeronautics (NACA) to the newly formed NASA. He served on NASA's Space Task Group that selected the original seven Mercury astronauts.

One of Low's first jobs as manager of the Apollo program office was to appoint Abbey as secretary of the newly formed Apollo Configuration Control Board (CCB). It was in this position that Abbey's skills as an acute observer rose to prominence. He became familiar with all aspects of the Apollo program from its organization and planning to its smallest engineering detail.

Abbey quickly grew to respect Low and over the years, that respect turned to deep admiration. Indeed, Cassutt points out that if there was an individual, other than Abbey's father Sam, who influenced Abbey's life the most, it was George Low. Years later when Abbey became the center director at the Johnson Space Center, his official director portrait shows Abbey at his desk with a portrait of Low hanging behind him on the wall.

After the fire, the Apollo program returned to flight with the successful launch of *Apollo 7*. During this mission, commander Wally Schirra developed a severe head cold that, in the confined spacecraft, soon spread to his fellow crewmates. The crew became achy, tired, and miserable. Compounding this was the fact that Schirra, along with fellow crewmembers Donn Eisele and Walter Cunningham, fell behind

in their flight plan. As a result, the crew grew frustrated and began openly criticizing mission control. The last straw came when Schirra declared that they would not wear their space helmets during reentry for fear of damaging their eardrums, which had become plugged by their colds. The media, as well as Abbey, were witness to these outbursts.

In spite of these problems, *Apollo 7* was a success. However, there were repercussions for the crew's behavior. For Schirra, *Apollo 7* would be his third flight into space and his last. Before the flight, Schirra announced that this would be his last mission and that he would retire upon *Apollo 7*'s successful completion. But for Eisele and Cunningham, *Apollo 7* was their first and last mission into space. NASA had to set an example and, as a result, Eisele and Cunningham never flew again.

Discipline was critical to the overall success of a mission, not only during training but during the actual flight. Failure in either of these reflected badly, not only on the program, but on management as well. Both astronauts and flight directors needed to be on the same team, and to management, the crew of *Apollo 7* clearly were not team players. This would eventually lead to a critical change within NASA that placed Abbey into what many regarded as his most powerful role.

When Chris Kraft succeeded Gilruth as director of the Manned Spacecraft Center in 1972, Abbey served as Kraft's technical assistant. After the final Skylab mission, Kraft sought to combine both flight crew and flight operations into one organization. After the Apollo-Soyuz program ended in 1975, the new flight operations directorate at JSC (the Manned Spacecraft Center



JSC Director George W.S. Abbey speaks to the crowd in Ellington Field's Hangar 990, 26 October 2000, during STS-92 crew return ceremonies. Credit: NASA

formally changed its name to the Johnson Space Center in 1973) was formed, which included the astronaut office and four other divisions: aircraft operations, crew training and procedures, flight control, and payload operations. Cassutt argues that this consolidation resulted, in part, from the problems experienced with the crew during *Apollo 7*. In addition, the new Space Shuttle program was quickly ramping up. Everyone knew that there would not be enough astronauts or flight controllers to support a greatly increased launch manifest. NASA would have to change how it trained both its astronauts and members of mission control. Combining these divisions into one single directorate brought more efficiency and greater oversight.

Kraft appointed Kenneth S. "Kenny" Kleinknecht to be the first director of flight operations. Even though Kleinknecht was an excellent engineer and had many years of senior management experience, he failed to adjust to the new position. Both the flight ops and flight crew divisions were not heavily structured and when Kraft combined them, things quickly fell apart. As a result, Kraft replaced Kleinknecht

with Abbey, a position that, Cassutt says, was “the most exciting and challenging assignment of his career.”²

It is not a surprise to learn that Abbey wanted to be an astronaut. When NASA began accepting applications for its fifth astronaut group, Cassutt reveals that Abbey flew his T-33 from Ellington Air Force base to his old duty station at Randolph Air Force Base in San Antonio. There, on Friday, 29 October 1965, he hand-delivered his astronaut application to the Air Force Personnel Center.³

Though Abbey himself was never chosen to be an astronaut, his new role as head of flight operations allowed him considerable influence over those who were and wanted to be astronauts. This was also true for flight directors who found themselves subject to Abbey’s influence. In deciding who would advance within flight operations to a coveted flight director position, Cassutt notes that Abbey “encouraged some and discouraged others.”⁴

As a result of Abbey’s new position as director of flight operations, the term “FOG” (Friend of George) began to circulate. Those within NASA as well as outside thought this implied favoritism, something that many openly criticized him for. Cassutt notes that according to Shuttle payload specialist Drew Gaffney, “you had to suck up” to Abbey “to go up.”⁵ Cassutt also shares how astronaut James Wetherbee, who served under Abbey in a variety of positions at NASA, confessed to being “dumbfounded” over such accusations. “You didn’t have to be a rocket scientist to know how to succeed,” he says. “You buried your nose in your workbooks, you talked to people, you studied the systems,

you trained. If you did that, you were rewarded.”⁶ Cassutt offers evidence to help dispel the claim that, in addition to working hard you had to be a FOG and join Abbey’s Friday afternoon drinking crowd to get a flight assignment. He notes that astronaut Jerry Ross never participated in any of these beer calls and yet made seven shuttle flights, tying him with Franklin Chang-Diaz for the most of any astronaut.⁷

Even so, for many, talking about Abbey could be career limiting. Critical remarks, especially within the highly competitive astronaut office, were best avoided. Those who failed to abide by this unwritten rule could find themselves promoted to obscurity... or worse. Cassutt offers an interesting observation from astronaut Rick Searfoss, who flew on the Shuttle three times. Searfoss described how Abbey ranked the astronauts, “There were three types of astronauts... those George liked, those he didn’t, and the vast majority who were in the middle, just solid citizens. That [middle] was where you wanted to be.” If Abbey liked you too much, Searfoss says, you could “wind up with some interesting management job that would take you away from flying for a couple of years.”⁸ This reveals how the astronauts, at least those wishing to fly, walked a fine line in their relationship with Abbey.

Cassutt portrays Abbey as having been a master sommelier when it came to assigning astronauts, offering the perfect pairing of crews to missions. For example, Cassutt describes why Abbey appointed Hoot Gibson as commander of STS-27, the second mission after the return to flight from the *Challenger* accident. Since

Gibson had commanded the last mission before *Challenger*, he initially told Abbey upon hearing of his assignment, “It’s not my turn.” Abbey replied, “Turns have nothing to do with it.”⁹ Cassutt uses this as an example to help justify Abbey’s way of thinking, explaining that the payload of STS-27 was a first-of-its-kind imaging radar system that the National Reconnaissance Office (NRO) had been developing. The special projects director of the NRO asked Abbey to assign a veteran Shuttle commander to the mission—someone who had recently served in that role. Abbey looked at who was available from the astronaut office in 1985 (before *Challenger*), and saw that Gibson was the only qualified choice. This rationale behind Abbey’s decision seems, in retrospect, logical.

While some crew assignments had a logic that was sound, others didn’t seem very logical, honest, or even fair, no matter how much scrutiny they received. A good example of this appears in a published account telling how Gibson was forced to command STS-71, a mission that he did not want to fly. Gibson, who was head of the astronaut office at the time, forwarded to Abbey his crew recommendations for the flight but Abbey kept sending them back saying “No, that’s not the right name.” Gibson would then change it and return it. This back and forth went on repeatedly, but Abbey would never make a decision. Gibson explained that this was Abbey’s way of keeping his fingerprints off of key—and unpopular—decisions, making it look like others made them. Eventually, Gibson learned that Abbey wanted him to command the mission, which made it look like Gibson, who was head of the astronaut office, had

picked a choice mission for himself after rejecting all the other candidates. Gibson realized that by taking the assignment, he would have to step down as head of the astronaut office, thereby allowing Abbey to replace him with someone more submissive. "That's the way George operates," Gibson said.¹⁰

There is no doubt that many astronauts disliked Abbey's management style, especially when it came to selecting crews. But it could also be argued that many did not agree with the methods used by Deke Slayton and Al Shepard, both of whom were responsible for making flight crew assignments prior to the Shuttle program. Under Slayton and Shepard, crews during the Gemini and Apollo programs would serve as backup, skip two flights, and then fly. That is, once you were chosen to serve as backup to a prime crew, you had a better chance of being rotated to the prime crew three missions later. But this was not a model system that could easily be applied to the Shuttle program and Abbey knew it. By 1982, the Shuttle was no longer considered experimental as officials declared the program operational. Training and mission requirements now focused on a complex mix of manifests that involved civilian, DoD, and commercial payloads with a whole new set of criteria to consider when assigning crews. In addition, JSC had to not only train the crews but prepare and integrate the payloads, which had their own set of mission requirements. JSC facilities could only support so many crews in training which left other astronauts waiting for assignments. During Apollo, an astronaut was either in rotation or not whereas a Shuttle astronaut might be out of rotation but still qualify for an assignment.

Cassutt reveals that Abbey was involved in everything having to do with the astronauts, from their training, education, and appearance, to speaking engagements and the design of their mission patches. To the public he was an "UNO" (unidentified NASA official). Sometimes Abbey's role was seen by the astronauts as being too paternal. Cassutt noted that Gibson was fond of saying that, "George treated us like children. He acted as though he was our father, often making decisions we would rather have made ourselves."¹¹ But, in many respects, the astronauts needed parental control. These folks were bright, entitled, and highly competitive. They had to be to have gotten where they were. Some were badly behaved and felt that they could do no wrong. As a result, a few made some very poor decisions from flight violations in their supersonic T-38 jets and open marital shenanigans to concealing dangerous medical



During a break from a 1 April 1982 debriefing session, the STS-3 crew members look over some of the photography of their launch from the Kennedy Space Center along with other participants of the meeting. Astronaut Jack R. Lousma is second from left; astronaut C. Gordon Fullerton is at left. George W. S. Abbey, director of flight operations at JSC, is second from right, and astronaut Joe H. Engle, STS-2, is at right.

Credit: NASA

conditions. And like children being scolded by a strict parent, when Abbey handed down discipline, it was naturally met with objection.

Abbey attended every flight readiness review. He would then fly with the crew to the Cape to help oversee their final activities prior to launch. On launch day, he would get up with the crew, breakfast with them, and then accompany them as far as the launch control center, and, if the mission got scrubbed, return with them and repeat the whole process over again the next time. After a successful launch, Cassutt describes how he would head back to his home in Houston where, divorced and caring for five kids, he put together dinner then drove across the street to his office at the Johnson Space Center to monitor the crew air-to-ground communications and catch up on paperwork. Upon landing, he was sure to be at the landing strip ready to greet each returning crew and escort them back to Houston.

Such daily involvement might appear, to most, as part of Abbey's ongoing effort to exert control or maintain influence over the astronauts. But Cassutt presents these actions as evidence that he truly cared about their welfare, and I believe that Abbey did.

During the *Challenger* accident, Abbey was at the Cape to escort the crew to the launch pad. In the aftermath of the tragedy, he rushed to gather the astronauts' families so he could usher them into the crew quarters where, as Cassutt explains, Abbey had to tell them that the accident was probably not survivable. It was a low point for the program and hit Abbey especially hard. The price for interacting so closely with the Shuttle crews

was that Abbey also had to bear the guilt of knowing that in selecting individuals to be astronauts and assigning their flights, he was directly responsible if something went tragically wrong.

In the wake of the *Challenger* disaster, Richard Truly became associate administrator for spaceflight at NASA HQ. The Rogers Commission was investigating the accident and the agency was in turmoil. No one knew what to do or even if NASA would continue with the Space Shuttle program. One of Truly's first acts was to assemble a team of specialists, known as a "tiger team," that included Abbey. Together, they developed a plan for returning the Shuttle program back to flight status.

During the post-*Challenger* period, Abbey continued to serve in a variety of administrative tasks and support roles, mostly at NASA HQ. On 20 July 1989, the twentieth anniversary of the *Apollo 11* lunar landing was marked by President George H.W. Bush's proposal for a new Space Exploration Initiative (SEI) that would build a space station and return astronauts to the Moon before heading to Mars. Some 450 people, including Abbey, worked on this 90-day study, which arrived in November of that year with a thud. The study's ambitious multi-decadal effort fell onto deaf ears as did its estimated half-a-trillion-dollar price tag.

In 1991, Abbey was appointed to the National Space Council where he worked closely with Truly, now NASA administrator, former astronaut Tom Stafford and Bush's presidential space policy advisor Mark Albrecht, who also served as the Council's executive secretary. The Space Council formed a Synthesis Group to try and create a more realistic roadmap for human spaceflight. It was during this time that Abbey established a regular Friday evening event he called "Vespers." Cassutt explains that these were "like something out of Victorian tales of gentlemen's clubs, that day's guest briefer would essentially sing for his supper—would make conversation with staffers that would, in classic Abbey fashion, illuminate or give a different perspective on the official subjects."¹²

Cassutt reports that Albrecht got to know Abbey during these meetings and gained a healthy respect for both the man and his knowledge. "Talking to him was like having the decoder ring for NASA" said Albrecht of Abbey. "He was the Indian guide. I was fairly animated, and I would be waving my arms and saying, 'What the fuck are they doing?' And he would shuffle and shift and mumble this is what's going on. (Cassutt points out that Abbey's mumble was a personal tic as well as strategy that he often used "when he was having a conversation

he didn't want to have.")¹³ And he was always right. He was loyal. He was smart. "With Abbey on the National Space Council," Albrecht said, "the White House couldn't be flimflammed by NASA."¹⁴ Truly objected to Abbey's appointment to the Council but the NASA administrator soon found himself replaced.

In 1992, Dan Goldin was selected as the space agency's new administrator. Even though he briefly worked for NASA early in his career, Goldin was still considered to be an outsider by those inside the agency. When Bill Clinton won the presidential election and took office the following year, Goldin remained as the NASA administrator.

Abbey and Goldin soon became close friends. As Cassutt writes, Goldin would call Abbey at all hours of the day and night, and they would talk on the phone for hours, joking and laughing. Suzanne Abbey, one of Abbey's daughters, recalls that, "Goldin was just obsessed with Dad—he would always be asking us, 'what does he do in his spare time? Where did he come from?' I think Goldin was a big loner and was intrigued by Dad's big family."¹⁵

Both Abbey and Goldin were never big supporters of the initial space station design. Then called *Freedom*, the station's price tag was unsustainable and the Clinton administration told Goldin to either come up with a less expensive option or the program would be cancelled. With the Shuttle still anemic after *Challenger*, Abbey realized that another accident could cancel that program entirely and without the president's support of the space station, NASA's future would be in jeopardy altogether. As Cassutt declares, it was here that Abbey would make his "most remarkable—and least known—political contribution."¹⁶

In one of the book's most interesting narratives, Cassutt tells how Abbey, along with Goldin, assembled a bunch of old Apollo hands that included Max Faget, Joe Shea, and John Young who all met at Tom Stafford's DC townhouse during one weekend in February 1993. As Cassutt writes, "The subject of this secret, off-site, off-the-books meeting was NASA's future, and that of Space Station *Freedom*."¹⁷ Clinton's new science advisor, John Gibbons, told Goldin to come up with a new plan and they only had until the end of the weekend to do it.

Cassutt explains that the team went to work with legal pads and matchsticks to try and salvage the program. It was during this time that the cylindrical modular design of the space station came into focus, a design already used by the former Soviet Union in the construc-

tion of their orbiting *Mir* space station.¹⁸ Cassutt goes on to tell that during that weekend, the 71-year-old Faget found a box of matches then jumped up on a table to illustrate the concept:

“The brain behind Mercury, Apollo, and the Space Shuttle—who also built balsa-wood models as a hobby—smiled as he broke the matches into smaller pieces and arranged them on the tabletop. ‘Here’s your hub,’ he said. ‘Here’s you first module.’ He proposed a hub-base block (like *Mir*) with four additional modules attached at ninety-degree points around it. ‘Shuttle docks to the X-axis,’ he said. The nose of the hub.”¹⁹

The new space station redesign was appealing but the Clinton administration found an even more convincing argument to help save it. In the wake of the breakup of the Soviet Union, Rose Gottemoeller, a member of Clinton’s National Security Council, was trying to find a way to keep the vast network of Russian aerospace companies from falling into the wrong hands. She reasoned that one way to do that would be to enlist this extensive network of former Soviet aerospace design bureaus in a joint project with the U.S.—a sort of “Apollo-Soyuz” on steroids. Abbey and Goldin agreed.

The redesigned space station plan, complete with a 2 billion-dollar-a-year budget cap and promise to use Russian hardware, appealed to the president. Shortly afterward, Congress got onboard and the space station program was saved.

By 1996, Abbey came back home to Houston, returning as the director of the Johnson Space Center. As Cassutt points out,

“Abbey finally landed the job he’d wanted for 20 years...the ultimate staffer was now in charge of US human spaceflight.”²⁰

With Abbey as head of JSC, construction of the *International Space Station* (it would no longer be called *Freedom*) began to get underway. But before the first elements of the massive new station could be launched, NASA created a new program known as Shuttle-Mir.

Formally known as “Shuttle-Mir Phase-One,” the program involved joint training of astronauts and cosmonauts that culminated in a series of Shuttle flights that would launch to the orbiting Russian space station. Crews would be exchanged that culminated with a series of missions in which astronauts would spend periods of time living aboard *Mir*. These flights were learning experiences designed to prepare both countries for much longer stays aboard the *ISS*, which would replace *Mir*.

That same year, a new book came out which drew a considerable amount of attention from both inside and outside NASA. In *Dragonfly—NASA and the Crisis Aboard Mir*, author Bryan Burrough revealed the vast differences in management style and culture between the two space superpowers that were working on the Shuttle-Mir program. Whereas NASA ran its programs by the book with everything out in the open, their Russian counterparts held everything close to the chest and worked in secret. Documentation for the Russians meant vulnerability, but if they kept everything in their heads (instead of on paper), they had job security.

Abbey, whose management of the Shuttle-Mir program peaked during this time as director of JSC,

was a central figure in *Dragonfly*. Burrough’s book was highly critical of Abbey, and when it first came out, it created quite a stir. Abbey, of course, hated it. In fact, he despised the book so much that he funded the production of NASA’s own account of the program. A contract historian was commissioned to work on the project but soon walked away. NASA then hired an author of children’s stories to write it. The end result was a coffee table book filled with photos and little else.

During the years of the Shuttle-Mir Phase-One program, the relationship between Goldin and Abbey grew strained at a time when Goldin was on his way to becoming the longest tenured administrator of NASA. Like Abbey, Goldin saw the first element launch of the *ISS*, but by early 2001 cost overruns in the program proved embarrassing for the newly installed George W. Bush administration, and Goldin left NASA. But before doing so, he removed Abbey as director of JSC. Cassutt reports that within just a span of six short years, a mutually supportive relationship between Goldin and Abbey had grown hostile, and that the two have not spoken to each other since.

On 3 January 2003, having accumulated more than 50 years of government service, 39 of them with NASA, George W.S. Abbey officially retired. Almost as if on cue, the history-making Shuttle program that Abbey was so heavily involved in helping to create would retire as well. Less than a month after Abbey left NASA, the Space Shuttle *Columbia* burned up during reentry, killing all seven of its crewmembers. The tragic failure of STS-107 marked the beginning of the end for the agency’s longest running and most ambitious human

spaceflight program. Eight years later, the Space Shuttle officially flew its last mission with the successful launch and landing of STS-135.

In looking back over Abbey's career, Cassutt argues that saving the space station stands out as his most important contribution among a long list of achievements. After the tragedy of *Columbia* and the close of the Shuttle program, one would be hard pressed not to agree. In spite of the many controversies that the man generated during his long tenure with NASA, Abbey did not invent the *International Space Station*, but by pressing for a practical and political solution that involved partnering with the Russians, his goal of maintaining a continuous human presence in space was achieved. How ironic that Abbey's career, launched in the midst of a Cold War competition with the Russians, would close by having to cooperate with them.

But that cooperation was problematic, and herein is my main criticism of Cassutt's otherwise insightful book. In *Dragonfly*, Burrough focuses on the many political and bureaucratic intrigues inside the Shuttle-Mir program, all the while putting Abbey front and center, revealing who this man is while perpetuating the many myths about him. Surprisingly, Cassutt mentions *Dragonfly* only once and does not connect it to Abbey. Even though Burrough's work presents both critical and complimentary viewpoints about Abbey, his tone remains overwhelming negative. Cassutt, however, plays to the opposite camp, overlooking the negative charges levied by Burrough against Abbey, and missing a chance to produce a more balanced portrayal.

As the Shuttle-Mir Phase-One

program wound down during the summer of 1998, I joined NASA to begin the first of a four-year appointment as historian of JSC. It had been a number of years since a civil servant formally occupied that role and George Abbey created the position in an effort to reestablish a more permanent history function at the center.

I became familiar with the many "tales of George" while working at JSC, all of which made for interesting conversation. However, as Cassutt confirms in his book, most are difficult if not but impossible to corroborate. It seems certain that some of these rumors about Abbey must be false, but by largely ignoring them, Cassutt misses a chance to justify his overwhelmingly positive portrayal.

In any complex program where there are multiple levels of management, there always remains the fear of speaking out. NASA is no different. At the height of Abbey's power while center director at JSC, the many problems encountered during the Shuttle-Mir Phase- One program cannot be explained away simply as being a result of differences in culture and management. Or, as in the case of *Dragonfly*, perhaps exaggerated by an investigative journalist. Yet Cassutt offers little insight into that tumultuous period.

During my first year at JSC, people spoke about Abbey's portrayal in Burrough's book. Most of those involved with Shuttle-Mir Phase-One agreed that working with the Russians was a challenge. But a question that Cassutt fails to answer is if Abbey's intimidating management style magnified those challenges by inhibiting open and frank discussion out of fear of repercussions. Astronaut Michael R.

"Rich" Clifford, a Shuttle astronaut who retired in 1997, says "People are just plain afraid of Mr. Abbey. If you get on his bad side, you won't get a flight assignment. The smart ones, which is 95 percent of us, know to confine their protests to safety issues. If you're talking about safety, there's never been a compromise on that. But there are other parts, issues dealing with training and the selection of crews, that you don't dare speak up about."²¹

Astronaut and former NASA Administrator Admiral Richard H. Truly once said that in order to tell the real story about Abbey "you would have to interview hundreds of people to write that book."²² As meticulous as Abbey was in observing and taking notes about others, little has been written about the man himself.

The earliest attempt to reveal more about the enigmatic Abbey occurred in 1983. *New Yorker* staff writer Henry S.F. Cooper began researching an article about the astronauts involved in preparing for the space shuttle *Challenger*, mission STS 41-G, which was launched in October 1984. Cooper, who had previously authored a book about *Apollo 13*, approached Abbey and obtained his permission to follow the crew during their training. The *New Yorker* never published the piece but Cooper expanded the article into a book, which was published in 1987 under the title *Before Liftoff: The Making of a Space Shuttle Crew*. The book gives a good accounting of how the crew trained and prepared for their mission. In addition, the author provides the earliest published account of Abbey, describing him as "straightforward" but also one who has "cultivated an air of considerable mysteriousness" all the while

alluding to Abbey's uncanny ability to remain "out of the limelight."²³

As Cassutt learned, the only real way to know Abbey is to talk to others. Of the nearly 300 sources cited by Cassutt in his book, two-thirds of them are from interviews done either by the author himself or drawn from over 1,000 oral histories conducted by NASA's Johnson Space Center Oral History Project (OHP).

Among the many pet projects that Abbey initiated during his time as center director at JSC, one of the most enduring was the OHP. Founded in 1997 by Abbey himself, the project's goal is to document and record memories of those individuals involved in the history of human spaceflight. Always a big fan of history, Abbey took special pride in supporting this effort, even, as Cassutt points out, coming to bat after retirement in support of its funding when it looked like NASA would cancel the project. How ironic that the man known for keeping his own story so private was responsible for initiating a project that encouraged his fellow NASA workers to freely tell their own.

Cassutt made extensive use of NASA's online history database when researching his book. The public can easily go online and view over 1,000 interview transcripts that make up the collection. However, when browsing the online list of people interviewed as part of the project, twenty of them are listed as having been interviewed, but with no available transcript. Officially, "those transcripts have not been released yet." Intriguingly, both Abbey and Goldin's names are among the twenty interviews that remain "not accessible." Although Cassutt was successful in getting through to Abbey and many of his associates, the author admits that he

was not able to approach Goldin, even after multiple attempts.

Richard Truly once said, "The real book about the manned space program would be a book about George Abbey."²⁴ While working at JSC, I searched their history collections for anything on Abbey and came up short. In the end, I was able to confirm what I already knew—plenty of people had something to say about Abbey (off the record) but very little is available in print. In the twenty years prior to the release of *The Astronaut Maker*, other books have only given a cursory mention of Abbey. These include Jerry Linenger's *Off the Planet* (2000) and Mike Mullane's *Riding Rockets* (2006).

In addition to the seven years that Cassutt spent on writing *The Astronaut Maker*, the author brings a considerable amount of previous knowledge and experience that makes him well qualified for this work. Cassutt has an extensive track record of research in the history of spaceflight. Starting in 1987, he published the critically acclaimed encyclopedia *Who's Who in Space*, which offers detailed biographies of every human who has ever gone into space. Since then, three more subsequent editions have been published. In addition, Cassutt has co-authored two previous astronaut autobiographies—*Deke!* (1994) with astronaut Donald K. "Deke" Slayton and *We Have Capture* (2002) with astronaut Lt. Gen. Thomas Stafford. Abbey worked alongside both Slayton and Stafford who, like Abbey himself, were highly influential in shaping NASA's human spaceflight program and in directing the men and women that served in the astronaut corps.

Cassutt's book succeeds in humanizing the man but many questions remain unanswered. I think readers will go away knowing more

about Abbey but still not have a complete picture of who Abbey really is. Whereas *Dragonfly* and *The Astronaut Maker* offer two compelling readings on a man thought "unreadable," a more complete story remains to be told that falls somewhere between these two books. No proper historical assessment of Abbey's legacy would be complete without in-depth histories of the astronaut office, *ISS* (post *Freedom*) and the Shuttle-Mir program. In addition, a biography of Goldin is needed to complete the tale. All of these are excellent thesis topics and would greatly contribute toward a better understanding of Abbey not only as the agency's astronaut maker, but also as an influential decision maker who helped shape the course of NASA's human spaceflight program to its present state.

About the Author

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Notes

1 Michael Cassutt, *The Astronaut Maker—How One Mysterious Engineer Ran Human Spaceflight for a Generation* (Chicago Review Press, 2018) 83 in pre-publication draft.

2 Cassutt, 157.

3 Cassutt, 51.

4 Cassutt, 229.

5 "Mr. Inside" by Michael Cassutt, *Air & Space Magazine*, August 2011, 53.

6 "Mr. Inside," 53.

7 Cassutt, 394.

8 "Mr. Inside," 53.

9 Cassutt, 310.

10 Bryan Burrough, *Dragonfly: NASA and the Crisis Aboard Mir* (HarperCollins, 1998) 24-27.

- 11 "Mr. Inside," 54.
 12 Cassutt, 331.
 13 Cassutt, 188.
 14 Cassutt, 334.
 15 Cassutt, 372.
 16 "Mr. Inside," 54.
 17 Cassutt, 352.
 18 Cassutt, 356.
 19 Cassutt, 357.
 20 "Mr. Inside," 55.
- 21 *Dragonfly*, Bryan Burrough, 34.
 22 *Dragonfly*, Bryan Burrough, 18.
 23 Henry S.F. Cooper, *Before Lift-off: The Making of a Space Shuttle Crew*, (Johns Hopkins University Press, 1987) 21
 24 *Dragonfly*, Bryan Burrough, 18.

ERRATA

An alert reader pointed out some errors in DARPA's official space history that appeared in the Volume 24 #4 issue of *Quest*. The authors' refer to the Saturn C-1 using Centaur (Pratt & Whitney RL10) LH2/LOH engines on the 2nd and 3rd stages and a follow-on Saturn "B-1," which they say used Centaur engines on the 3rd stage.

Since neither the Saturn C-1 nor the 1B had a 3rd stage, to confirm what was written we decided to research whether there was a preliminary design configuration or a classified effort. One of the author's referred us to *DARPA Technical Accomplishments: An Historical Review of Selected DARPA Projects, Volume I*, IDA, P-2192, 1990;

the original source of the information.

As DARPA does not currently have a historian, we reached out to the NASA Headquarters history office. They confirmed that the Saturn 1 (known in the early development phase as C-1) had eight H-1 engines in the first stage, and after initial launches with dummy second stages, it had a second stage with six RL-10 Centaur-type engines. The Saturn 1B had a Rocketdyne J-2 engine in its second stage. Using the Centaur as the upper stages for Saturn was proposed by the Silverstein Committee in 1959, but MSFC developed the J-2 liquid hydrogen engine instead. Additional information on the story behind the J-2 is available in the NASA history publication, *Stages to Saturn*.

REAL SPACE MODELING

By Keith J. Scala

I believe that models are one of the best ways to preserve space history. Every time you visit a NASA space center or private museum that has space exhibits you will find space models. They are an excellent way to visualize space hardware in scaled down form.

Museums have limited space to display large launch vehicles, since most are more than 70 feet in length. Except for the Space Shuttle, all launch vehicles launched before 2015 ended up being thrown away into the ocean or crashed onto the plains of Russia. Most satellites and space probes were sent on one-way trips, never to return to Earth. Displays in museums had to make do with unflown spare hardware, which is limited in availability. Models of rockets and spacecraft are therefore needed any time an organization wants to explain space history.

There are a few companies that produce ready-to-display models, and at least one NASA center, the

Marshall Space Flight Center in Huntsville, Alabama, has its own display model department. Producing a good model of any historical real spacecraft or launch vehicle requires a great deal of space history research. When I have seen display models, I always have the feeling that something is missing or inaccurate. Many scaled-down display models or even full-sized models omit details to be less expensive to produce.

Seeing an advertisement for a plastic space model makes me feel that I can purchase space history in a box. After purchasing the model kit and reading through the instructions, I think to myself that I can improve it during the assembly process. I am not alone in feeling a more detailed model can be built. This striving for a better model has spawned a community of space modelers.

I have found that more advanced space modelers call themselves "real space modelers." This is an experienced group of modelers that make models of "real" space vehicles, instead of modeling "fic-



The three white squares on *Faith 7* (arrow), covered over by clear plastic and tape during the pad tests. Credit: NASA

tional" space machines from *Star Wars* or from other fictional universes. Hence the name "real space modelers." Members of this group usually start with a commercially available plastic model kit from the hobby store. After extensive research they will work to improve or modify a plastic model kit to represent one specific space mission in almost every detail.

Many of these modifications are scratch built or available from second-party model companies that sell kits to improve on the main kit. The original kit is usually a plastic