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Expanding on '*The Right Stuff*'

'The Right Stuff: *the qualities needed to do or be something, especially something that most people would find difficult. [Demonstrating] the right stuff to be a leader.*'
Cambridge English Dictionary

In July 1975, just six years after Apollo 11 had journeyed to the Moon, the last three NASA astronauts to fly an Apollo spacecraft splashed down in the Pacific Ocean at the end of the joint Apollo-Soyuz docking mission with the Soviets (ASTP). Though it had been known there would be a delay in sending the next American astronauts into space on the Space Shuttle, few would have foreseen the six-year void between ASTP and the first Shuttle Orbital Test Flight.

Despite this, there were already developments at the Johnson Space Center (JSC) near Houston, Texas, to expand the astronaut corps and choose the first new astronauts since 1967[1]. For over 15 years, the Astronaut Office had at its heart a defined military pilot hierarchy, with only a slight amendment to include suitably qualified former military civilian test pilots or, as in 1965 and again in 1967, scientifically educated candidates. Even these academic candidates had to qualify from a United States Air Force (USAF) jet pilot course before going on to train for *possible* flight assignments in Apollo spacecraft.

[1] The men who formed NASA's seventh astronaut group in August 1969 had been selected under the criteria for the classified USAF Manned Orbiting Laboratory. Chosen in three groups (November 1965, June 1966 and June 1967), seven of them transferred to NASA two months after the cancellation of the military space station program.

D. J. Shayler, C. Burgess, *NASA's First Space Shuttle Astronaut Selection*,
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PIONEERING THE SELECTION OF SHUTTLE ASTRONAUTS

It was the daring deeds of the Astronaut Office, emblazoned across popular U.S. media of the time and rooted in the test pilot community of the 1950s, which had given rise to the legend of "*The Right Stuff*." These were cool-headed, hardened test pilots who could push any plane to its limit and just beyond and, even after flirting with the brink of disaster, would bring the aircraft home safely before repeating the evaluation the next day. Work hard, fly hard and play hard was the culture that found its way into the new Astronaut Office at NASA, first occupied by seven Mercury astronauts in 1959.

This ethos continued for nearly 20 years, so much so that when the new Scientist-Astronauts joined the fraternity in 1965, they were judged to rank below test pilots, jet pilots, astronaut wives and even astro-chimpanzees in the flight hierarchy. By 1975 and the end of the Apollo era, many from the original selections had retired, while most of the Scientist-Astronauts still awaited their first flight (as did some of the Pilot astronauts from later selections). Now, with the Shuttle in the pipeline, there were rumors of a new selection; a need for more Pilot astronauts who did not have to be test pilot trained, and of a new category called the Mission Specialist (MS) who could be chosen from academia. Even more concerning to some who had waited years to fly were the Payload Specialists (PS) – not even full-time astronauts – who could come along with their experiments, train for a few months, take a prized flight seat to space, and then return to their previous occupation after just one mission, perhaps even before some of the still-rookie veterans had the chance to strap in on the launch pad. On top of this, NASA was promoting the idea of expanding the cadre to include minority candidates and the first women in the NASA astronaut program. At the Astronaut Office at JSC, the mid- to late-1970s were a time of great change and challenges.

In 1976, NASA issued its first call for new astronauts for a decade, one with a significant change to past selections. These candidates would be chosen and trained specifically for flights on the Space Shuttle, then still under development and some years from its first test flight. This was the dawn of a new era at NASA's Astronaut Office and the successful group would follow a very different training program and career to those chosen during the 1960s. Though not evident at the time, this very different and diverse eighth group of astronauts would play a major part in evolving the roles of a Space Shuttle crew, and in the twilight of their astronaut careers many would move on to senior managerial roles within NASA or the space industry. But that was very much in the future. In July 1976, the search for these new and very different types of American astronauts was set in motion (see sidebar: *If at first…).*

The call goes out

Issued simultaneously by NASA Headquarters, Washington D.C., and JSC in Houston, Texas, the space agency's News Release No. 76-044, dated Thursday, July 8, 1976, announced a recruiting call for pilots and Mission Specialists to live and work on the space agency's forthcoming fleet of Space Shuttle Orbiters. Applications, it said, would only be accepted if postmarked prior to midnight on June 30, 1977 – a year hence – and all those who applied would be advised of the success or otherwise of their application as the process moved through to a conclusion, likely to be sometime in December 1977.

"At least 15 Pilot candidates and 15 Mission Specialist candidates will be selected," the news bulletin stated, "to report to the Johnson Space Center on July 1, 1978, for two years of training and evaluation. Final selection as an astronaut will depend on satisfactory completion of the evaluation period." **[1]**

IF AT FIRST…

With each NASA astronaut selection, there are those who make the cut, the successful candidates who become NASA's new astronauts. Then there are those who reach the final shortlist but fall at the final hurdle for one reason or another. Some try again and are more successful next time around. For others it would take more than one application over many years before they made it. Hundreds never did, but perseverance is one of the natural traits of an astronaut candidate – and a dose of good fortune never hurts either – as this side-story of the 1978 astronaut selection, by fellow spaceflight researcher Bert Vis, reveals **[2]**:

NASA Class of 1978 Astronaut Applicant Mario Runco Jr.

Persistence would eventually pay off for one candidate, who first applied to NASA for the Group 8 selection. Mario Runco Jr., was born in The Bronx, New York, in 1952 and lived there until his family moved to the neighboring town of Yonkers in 1963. He graduated from the City College of New York, where he played collegiate ice hockey, and earned a Bachelor of

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Science (BSc) degree in 1974. He then went on to earn his master's degree at Rutgers University and spent a year working as a research hydrologist with the U.S. Geological Survey, prior to joining the New Jersey State Police in 1977. He would serve as a New Jersey State Trooper until he joined the U.S. Navy in June 1978. He served as a Geophysics Officer in the Navy, working in the fields of meteorology, oceanography, and geodesy, earning his ship Surface Warfare Officer designation while serving aboard the amphibious assault ship USS *Nassau* (LHA-4). He also served at sea aboard the hydrographic survey vessel USNS (United States Naval Ship, the designation given to non-commissioned ships which remain the property of the USN) *Chauvenet* (T-AGS-29) as Commanding Officer of Oceanographic Unit 4.

By the time he joined the Navy, NASA had already been advertising for prospective space explorers to apply for Pilot and Mission Specialist astronaut training for the Space Shuttle program. Even though Runco had barely a few months of Naval service, and the Navy required a minimum of five years of active duty for its applicants, he applied anyway. "That way," he said, "the Navy would know that I wanted to do this." He was quite philosophical about his rejection when the news reached him, knowing it had been a long shot and that there was much else in life to pursue, but it would not prevent him from trying again… and again, and again.

Runco first met his future wife, Susan Kay Friess, from Sylvania, Ohio, in 1978 while they were both stationed at their respective first duty stations in Monterey, California. Susan was also a fairly new Naval Geophysics Officer, at the Fleet Numerical Weather Center, and Mario was at the Naval Environmental Prediction Research Facility. It turned out that both had an interest in the space program, but it was Susan who first learned that the Navy and NASA were accepting applications for the astronaut corps and told Mario about it. They both applied that year but neither was selected. Undaunted, Mario applied again as a Mission Specialist for the astronaut selection of 1980 but again was not selected. By the time of the 1984 group selection, however, the two were married and had finally achieved the requisite five years of active duty, so they both submitted applications while they were assigned back in Monterey, California, after tours of duty on the East Coast in Norfolk.

Mario was serving as an instructor with the Navy Geophysics Readiness Laboratory at the Naval Post Graduate School and Susan was a student there pursuing her master's degree. The Navy selected only Mario and sent his

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name and application to NASA along with the names of the other Navy selectees. He was not invited to interview by NASA that year, but true to his Calabrian heritage *(used with permission)* he stubbornly applied once more in 1985 and was again selected by the Navy. Once again, NASA never called him for an interview. His fifth attempt was successful, however, and Mario was both selected by the Navy and finally called to be interviewed by NASA in 1987, which he did in March of that year while both he and Susan were stationed in Hawaii. Susan did not submit any more applications after the one in 1984. Mario eventually reported for duty to NASA in August of 1987, while Susan would continue her tour of duty at Barbers Point for another year before joining her husband in Houston. By that time they had already had their first child, who was barely a month old when she made the trip from Hawaii to Texas.

By coincidence, the Navy was keenly interested in performing oceanographic observations from manned spacecraft and there was already a billet at the JSC for a Naval Geophysics Officer. The Navy also had a policy of trying to keep married couples together, so after Mario was selected, the Navy assigned Susan to the billet at JSC, where she would eventually train astronauts in Crew Earth Observations and in meteorology, oceanography, and geography.

During a conversational interview in 2018, while both were attending the XXXI Congress of the Association of Space Explorers in Minsk, Belarus, Mario told Bert Vis that after his selection, he later found out that in joining the astronaut corps as a member of Group 12 (George Abbey's Final Fifteen, aka "The GAFFers") in June 1987, he may have inadvertently upset plans within his Navy community to have one of several other Geophysics officers selected. Up to that point, Mario's career in the Navy had been a meteoric rise, especially after his tour aboard USS *Nassau* (LHA-4). He was even selected to the rank of Lieutenant Commander a year early, which is known in the Navy as being "deep selected", and was immediately assigned as a Commanding Officer to an at-sea unit, Oceanographic Unit 4, operating in Indonesian and adjacent international waters. Shortly after his selection, however, when it came time for Mario to be seconded to NASA by the Navy, the officer in charge of assignments very much tried to dissuade and discourage Mario from the secondment. Mario took the assignment, of course, and the assignment officer, known as a "Detailer", was not pleased. When the time came for Mario to be promoted to Commander, he learnt that this same officer was on his selection board, so he knew that his promotion was unlikely

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and he was right. As a result, he would eventually retire from the Navy in 1994, fortunately at time when the U.S. military was downsizing and offering incentives for "early-outs". He would continue working as a civilian NASA astronaut and would eventually fly on three Shuttle missions: STS-44, STS-54 and STS-77.

Mario told Bert Vis that he felt fortunate with those three missions to have flown on two different Shuttles, taken off from both launch pads, landed on both coasts, flown ascent and entry from both the flight deck and middeck of the Space Shuttle, operated the Shuttle's robot arm, deployed four satellites, operated many onboard experiments, and performed an EVA.

By1993, though, the Naval oceanography community had lost interest in the manned space program and was intending to close the billet at JSC where Susan was assigned. This would have meant reassignment elsewhere, with the closest place being at the Naval Oceanography Command located, ironically enough, at the John C. Stennis Space Center in Bay St. Louis, Mississippi. This was some 595 km (370 miles) and six hours by car away and there was certainly no guarantee of her being assigned there. By then, the couple had had their second child, and their daughter and son were only five and three years old respectively. Being separated was not an option for them, so Susan also decided to leave the Navy during the period of "early-out" incentives. Before doing so, however, she had already tentatively lined up an oceanography position with Lockheed (LH), also in Houston at JSC. However, having left active duty to became a reserve officer and about to take on the LH position, a NASA position became available. Susan was hired and she continued to train astronauts in Crew Earth Observations as before. Ironically, she was promoted to Commander in the U.S. Naval Reserve (Individual Ready Reserve) shortly after leaving active duty. Mario related to Bert that, in the end, "I think George (George Washington Sherman Abbey) was very good to us!"

MEETING THE ASTRONAUT CRITERIA

Pilot applicants were required to possess a BSc degree from an accredited institution in engineering, physical science or mathematics, or to have completed all the requirements for a degree by December 31, 1977. An advanced degree or equivalent experience was preferable. They had to have accumulated at least 1,000 hours

first pilot time, with 2,000 hours or more increasing their chances. Experience in high performance jet aircraft and flight testing was also considered desirable. Additionally, they had to be able to pass a NASA Class 1 space flight physical, and range in height between 64 and 76 inches (163 to 193 cm).

Applicants for Mission Specialist candidate positions were not required to have any prior piloting experience. Educational qualifications were much the same as for Pilot applicants, except that biological science degrees were included. These applicants had to be able to pass a slightly less rigid NASA Class 2 flight physical. A height of between 60 and 76 inches (152 to 193 cm) was one specific requirement. There had also been a little relaxation in some of the physical requirements from previous astronaut groups; even those wearing glasses were now acceptable candidates, if the glasses corrected the user's vision to 20/20.

The space agency was not only keen to emphasize that the Space Shuttle would usher in a whole new era of qualified people working and testing new procedures in space – rather than training pilots to do these things – but also in rebuilding lagging public support for the space program by involving a far broader slice of America's population. The news release thus declared that "NASA is committed to an affirmative action program with a goal of having qualified minorities and women among the newly selected astronaut candidates. Therefore, minority and women candidates are encouraged to apply." **[1]**

Pathway to a whole new career

Previously, during the 1960s, NASA's Astronaut Office had taken on board two groups of astronaut candidates who were fully qualified in different disciplines of science and medicine, and were given the designation of Scientist-Astronaut. Only a select few, however, would ever achieve a flight into space in the pre-Shuttle era, with many opting out of the astronaut corps in frustration – mostly due to the cancellation of expanded Apollo and Skylab missions as well as ongoing delays in the Space Shuttle program – and returning to their academic fields. That would not be the case here. Apart from recruiting some additional pilots, the Shuttle program was very much a viable, ongoing and exciting alternative career option for any young scientist or medical practitioner, with the first flights due within a year or two of the conclusion of their astronaut training.

As Carolyn L. Huntoon, then NASA's JSC Deputy Chief for Personnel Development, put it: "This time, the agency wanted applicants who understood what would be expected of them and were willing to devote most of their careers to the program. They had to be very good in what they were doing and yet they had to be willing to give it up to do more general things. They had to understand that they would be rookie newcomers when they got here. That's a bit difficult to accept when people have excelled in their fields." **[3]**

Fig. 1.1: Dr. Carolyn L. Huntoon, Deputy Chief for Personnel Development, NASA JSC

Dr. Huntoon certainly knew what she was talking about. JSC Director Chris Kraft had personally asked her to consider applying for the candidate group, but after chewing over the prospect for a while she declined. Instead, she became the only woman on the selection board for the Group 8 astronauts, although the lead-up to this phase of the process had proven difficult.

"One of the things we had trouble with at that time was getting people to apply; getting women to apply particularly," Dr. Huntoon recalled in a 2008 interview. "I would say women and minorities, but particularly women, because we had never had any women in the Astronaut Corps. They did not expect that they'd have a chance to be selected. Even though we were saying it, it was hard. So we went out on quite a few recruiting trips to various universities and did a TV show in Chicago and around the country, talking about the selection and what they'd be expected to do; the jobs when they came here, and flying on the Shuttle, and that NASA was serious about considering women and minorities.

"This was a time in our country when also a lot of things changed for women, and you could no longer discriminate against women for their jobs," Dr. Huntoon continued. "I recall thinking how difficult it was to convince women [that] we were serious about selecting women." As part of her recruitment strategy, Dr. Huntoon would visit high schools, colleges, Lions and other community clubs and even retirement centers, trying to impress upon her audiences that NASA had a

broader recruitment focus, which now included women and minorities. "They would say, 'Oh, sure,' kind of thing. A lot of guys applied, but not that many women at first." **[4]**

Fig. 1.2: (main) Nichelle Nichols discusses the Space Shuttle program with students in NASA's Mission Control Center. (inset) Nichols as Lt. Uhura in the *Star Trek* series.

One of the people NASA employed to tour and promote the diversity of the astronaut recruitment process was African-American actress Nichelle Nichols, well known for her role as Lt. Uhura in the *Star Trek* TV series. Nichols revealed that NASA had specifically asked her to recruit women and minorities for the Space Shuttle program. She relayed her response to NASA with a mischievous twinkle in her eye, saying, "I am going to bring you so many qualified women and minority astronaut applicants for this position that if you don't choose one… everybody in the newspapers across the country will know about it." Nichols credited *Star Trek* with the success of her recruiting efforts. "Suddenly, the people who were responding were the biggest Trekkers you ever saw. They truly believed what I said… it was a very successful endeavor. It changed the face of the astronaut corps forever." **[5]**

Kathryn Sullivan had been awarded a BSc degree in Earth Sciences from the University of California in 1973, and a PhD in Geology from Dalhousie University (Nova Scotia, Canada) in 1978. While at Dalhousie, she participated in a variety of oceanographic expeditions under the auspices of the U.S. Geological Survey (USGS). Though fascinated with human space activities in her youth, she had never dreamt that she might one day tread a similar path into space, and working in Canada meant she was unaware of NASA's call for a new cadre of astronauts. "In fact, I didn't know about it at all until I went home to California to visit family at Christmas in 1976.

"I saw that little ad that finally helped me draw the parallel with expedition operations, clipped it out or whatever one did, dutifully sent off this little postcard that said, 'Hey, yes, I'd like to look into this.' I recall that if you sent the first inquiry in, they sent you back a postcard or short communiqué that basically read, 'This is just to make really sure that you're really sure,' and listed a few more of the medical requirements and other things. It clearly was a 'Really, please don't bother us if you don't fit this description. Think about it again.'

"If you thought about it again and either were going to ignore the conditions or knew that you passed them, then you sent another card in, and wrote, 'No, no, really, I would like an application package.' Then you got the big old giant application package. The bulk of the application package is a Mark-1 standard U.S. government civil service form; thorough, comprehensive. At some other levels, especially being a grad student in Canada at this point in time, I remember just being bemused and bewildered by parts of it." **[6]**

Another of the ultimately successful female applicants was Sally Ride, who had once given serious consideration to becoming a professional tennis player. Fortunately – even though she excelled at the sport – she found a far more satisfying career through her graduate studies in physics at California's Stanford University, where she became deeply involved in researching X-ray astronomy and free-electron lasers. On January 12, 1977, Ride was reading the campus newspaper, *The Stanford Daily*, which contained an interview with Margaret Collins, director of Stanford's Center for Research on Women. Under the headline, "NASA to recruit women," it stated that NASA was seeking applicants from qualified people – including women and minorities – interested in becoming Mission Specialist astronauts. Ride was not to know it at the time, but NASA's future plans involved transmitting energy from space stations back to Earth, which was her chosen field of study.

Enticed by the exciting prospect of working in space, Ride decided to apply, despite knowing little about what it might involve or how it might affect her career path, but with the determination that "I can do that." As she later revealed, her future direction was suddenly not quite as clear-cut as she had planned. "I thought

I was going to get a job… doing research in free-electron laser physics, and then work at a university doing research and teaching. That's what physicists do." There was also a lot of mystique involved in the prospect of training to be an astronaut. "I didn't know whether they were going to throw us into a centrifuge or hang us from the ceiling by our toes." **[4]**

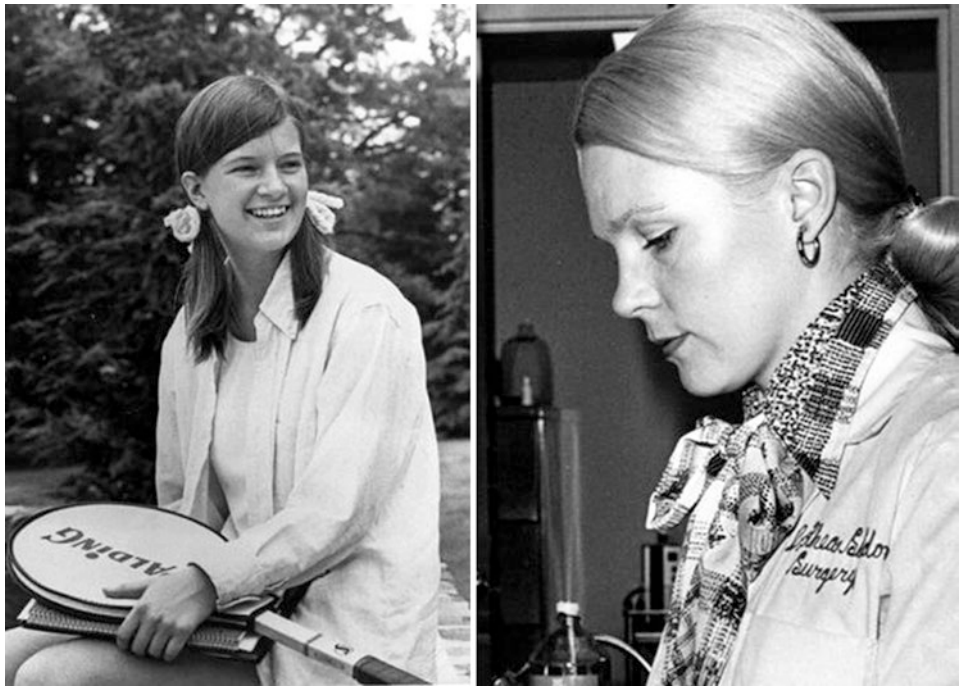

Fig. 1.3: (left) Sally Ride in her teenage years, excelling at tennis and with a deepening interest in science and astronomy (Image courtesy of Afflictor.com). (right) Rhea Seddon taking part in the residency program at the University of Tennessee medical school (Image courtesy of the University of Tennessee).

A question of astronaut pay

Despite the lengthy lead-in time of 12 months, many enquirers waited until the last minute to apply. Altogether, a total of 24,618 enquiries were received by NASA in that period, and of these, 20,440 requested and were sent application packages. **[7]** Eventually, 8,079 applications were received by the due date.

The question of wages for the civilian candidates was based on the Federal Government's General Schedule pay scale from grades GS-7 through to GS-15,

with approximate salaries from $11,000 to $34,000 per year. The candidates were informed that they would be compensated based on individual scientific achievements and experience. Other benefits included vacation and sick leave and participation in the Federal Government retirement, group health and life insurance plans.

Rhea Seddon, MD (also one of the successful candidates), was prepared to give up a potentially highly-paid career as a surgeon in order to take on an entirely new role as a Mission Specialist astronaut, which only offered a starting salary of $24,700 per annum. "Some of my doctor friends will never get over it," she said at the time. "They think I'm crazy." **[4]**

Any military personnel were asked to apply through their respective departments using procedures that would be disseminated later in the year by the Department of Defense (DOD). The astronaut recruits would be assigned to JSC, but would essentially remain on active military status with regard to pay, benefits, leave and other military matters.

At the time the call for applicants was issued, NASA still had 31 astronauts available as crewmembers for future Space Shuttle missions, including nine scientists. Of these, 28 were assigned to JSC, while three others held government positions in Washington D.C. **[8]**

PREPARING TO TEST THE APPLICANTS

On April 1, 1977, some four weeks prior to the deadline for applications, JSC medical personnel completed a week of practice in applying standards and conducting tests that would be used in the medical and psychological screening of the astronaut hopefuls. With the assistance of 20 volunteer subjects, the medical team worked out the logistics for the comprehensive evaluation during the Astronaut Medical Selection Exercise, directed by flight surgeon Dr. Sam L. Pool. Dr. Pool was serving at that time as NASA's Division Chief for the Medical Science Division at JSC.

Assisting in the evaluation tests were Drs. George Behaine, Michael Berry and Jerry Hordinsky of NASA; Joseph Harasimowicz of the USAF; and Charles Pickett of the U.S. Navy (USN). NASA records indicate that the 20 volunteer subjects – NASA personnel and outside consultants – were John Arnold, Frances Barbee, Linda K. Bromley, Gil Chisholm, James L. Cioni, James B. Costello, Roger W. Ellsworth, Paul O. Ferguson, Virginia Gibson, Thomas J. Graves, Kathleen Hosea, Samuel E. Jones, Gary Kane, Ronald R. Lanier, Stella Luna, Julie Mattheaus, Mary Lee Meider, Judy Olson, Dale Sauers and David K. Stoughton.**[9]**

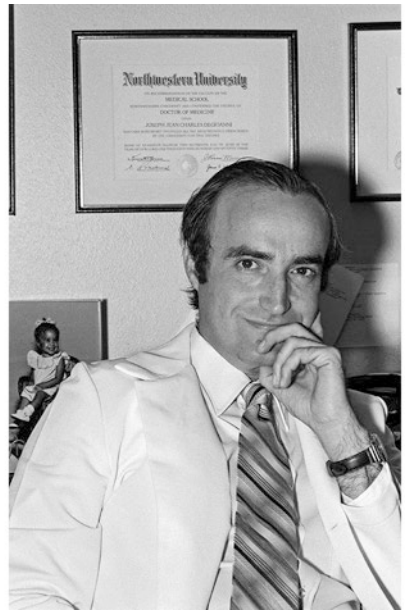

Fig. 1.4: Joseph D.C. Degioanni, PhD, MD, who not only worked in the Aerospace Medicine Division at JSC, but was also a candidate himself. (Image courtesy of Ed Hengeveld).

Testing the candidates and a delay

Dr. Joseph Degioanni, NASA's physical administrator for the recruitment exercise (and himself one of 208 candidate finalists), pointed out that the same medical evaluation would be applied to both Pilot and Mission Specialist candidates. The medical testing involved 24 different procedures, including a general examination by a NASA flight surgeon.

The evaluation included an examination of a candidate's medical history – illness, injury, surgery, and so forth – and carried through to psychological, psychiatric, ophthalmological, neurological, dental, musculoskeletal, body chemistry, and ear, nose and throat examinations, Also included was a battery of tests administered using the Lower Body Negative Pressure device, a rotating chair (the cupulogram, used to measure vestibular function and susceptibility to motion sickness), a treadmill, a Holter monitor (to measure heart rate over an extended period), and the 34-inch (86-cm) Shuttle Personal Rescue Sphere, to gauge a subject's susceptibility to claustrophobia.

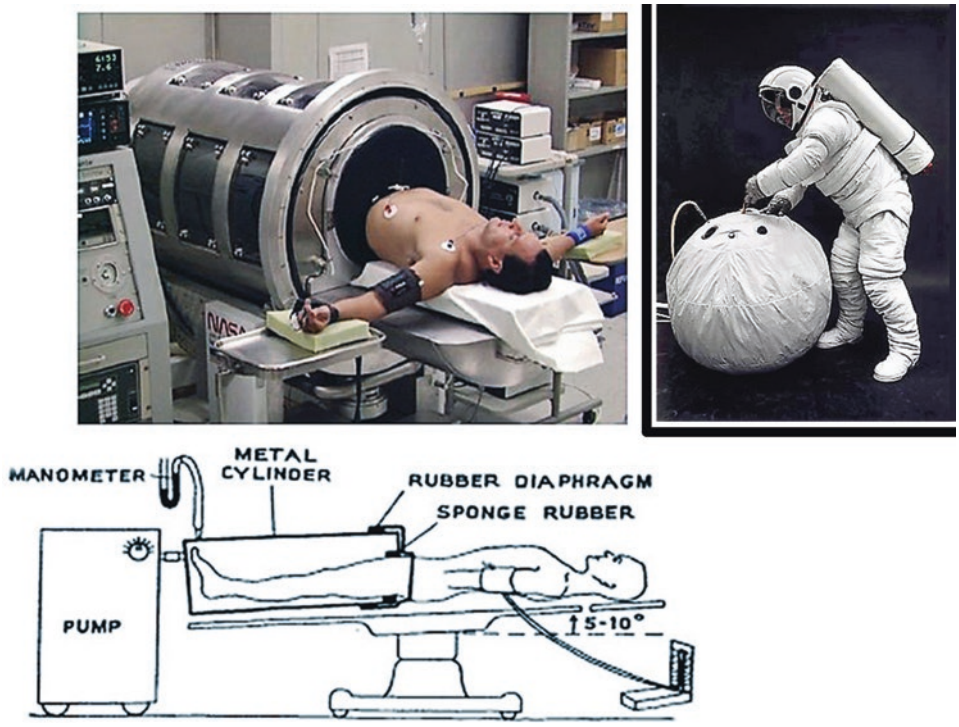

Fig 1.5: (main) A subject is tested in the Lower Body Negative Pressure device (Image courtesy of Science Direct). (inset top right) Demonstrating the Shuttle Personal Rescue Sphere.

Specific studies of body functions such as vision, hearing, exercise capacity and muscular strength were all regarded as important factors in the overall health evaluation. "We want to make this the best of all health screenings because it's for astronauts," Dr. Degioanni said at the time. **[9]**

Many of the applications received by NASA were obviously mailed more in hope than expectation, with a selection board swiftly eliminating over 2,000 enquiries that did not meet the rigid qualifications. With the number now reduced to 5,680, the panel's work began in earnest, weighing up each applicant using a rating system based on such factors as their background, education, abilities, degrees and workplace experience, while in the case of the pilot applicants, their flight hours and/or participation in combat were also taken into consideration. The applicants has also been asked to supply references, and contact was made with these referees in order to gain an insight into such areas as the applicant's personality, work ethic, talent and enthusiasm. This eliminated several more names.

It was a long and involved process, but eventually the list was whittled down to a workable 208. A schedule was drawn up, in which these applicants would be contacted and asked to travel to Houston for a week devoted to full-on medical examinations, psychological tests, and face-to-face interviews with members of the selection board.

The 208 candidates were then split into 10 interview groups and each applicant was provided with information as to when they needed to be in Houston. Their week began once they had checked into the assigned hotel, the Kings Inn Ramada on El Camino Real in Clear Lake, quite close to JSC. There would be an evening reception and pre-brief at the inn for the assembled candidates. Many of them already knew each other from science communities or military circles, but most were still getting used to the unexpected novelty and understandable bewilderment associated with making it through to this phase of the selection process. As Kathryn Sullivan recalled: "I remember thinking, 'Kath, enjoy this week a lot, because these people kind of really seem to have some sense of what the hell is going on here, and you really don't. So have a really good week, because this may be the end of the road. Enjoy it a lot'." **[6]**

Following the tests and interviews, 149 of the 208 applicants were found to be medically qualified for the astronaut program and indicated that they were still interested in pressing forward in their bid to make the final cut (see Table 1.1).

Table 1.1: GROUP 8 CANDIDATE BREAKDOWN

PILOTS				
QUALIFIED APPLICANTS	**INTERVIEWED**	**MEDICALLY QUALIFIED**	**QUALIFIED/ INTERESTED**	**SELECTED**
147 MILITARY (4 MINORITY)	76 MILITARY (3 MINORITY)	71 MILITARY (2 MINORITY)	70 MILITARY (2 MINORITY)	14 MILITARY (1 MINORITY)
512 CIVILIAN (6 MINORITY, 8 FEMALE)	4 CIVILIAN	4 CIVILIAN	4 CIVILIAN	1 CIVILIAN

MISSION SPECIALISTS				
QUALIFIED APPLICANTS	**INTERVIEWED**	**MEDICALLY QUALIFIED**	**QUALIFIED/ INTERESTED**	**SELECTED**
161 MILITARY (6 MINORITY, 3 FEMALE)	45 MILITARY (4 MINORITY, 2 FEMALE)	34 MILITARY (3 MINORITY, 2 FEMALE)	34 MILITARY (3 MINORITY, 2 FEMALE)	7 MILITARY (2 MINORITY)
5,519 CIVILIAN (332 MINORITY, 1,248 FEMALE)	83 CIVILIAN (8 MINORITY, 19 FEMALE)	43 CIVILIAN (4 MINORITY, 12 FEMALE)	41 CIVILIAN (4 MINORITY, 12 FEMALE)	13 CIVILIAN (1 MINORITY, 6 FEMALE)

NASA Administrator Robert A. Frosch had intended to complete a review of the data presented to him on the selection of the Group 8 astronauts in December 1977. However, at a meeting held with officials responsible for the selection

program on December 12, including JSC Director Chris Kraft, Frosch said that he was still involved in current budget activities and would not be able to complete his review until the following month. The announcement of the selection of the new astronauts would therefore be delayed until January 1978. **[10]**

There would be one small but significant difference this time, for those who were chosen. In the past, the selectees had immediately been called 'astronauts' as soon as they were chosen. For the Shuttle group, however, who would have to undergo a mandatory training and evaluation period, they would initially be known in NASA parlance as 'astronaut candidates,' or 'Ascans.' They would retain this title for the entirety of their envisaged two-year training program. Once each Ascan had successfully passed their training and evaluation period, they would officially earn the rank of 'astronaut' – although some pedants still maintain that a person cannot claim to be a true astronaut until they have flown into space.

AN APPLICANT REFLECTS

William D. (Bill) Heacox is a Professor Emeritus of astronomy at the University of Hawaii at Hilo, where he founded the University's undergraduate astronomy program and the Hōkū Ke'a observatory on Mauna Kea. He has published original research in both physics and astronomy, and has held research appointments at several institutions. At the time of the astronaut selections for the Shuttle program, he was a National Academy of Sciences/National Research Council (NAS/NRC) post-doctoral fellow at NASA's Goddard Space Flight Center.

"I was one of the sixth group of astronaut finalists in the 1977 Space Shuttle recruitment, sometimes referred to as the Space Science group," Dr. Heacox recalled. "Most people in the group, including me, had advanced degrees in astronomy or related sciences. I was somewhat unusual in also having a background in military aviation, having flown Navy jets for several years prior to entering into astronomy graduate education. On the face of it, I suppose I was an attractive candidate. The purpose of bringing applicants to JSC for interviews and tests was probably to weed out the chaff from the wheat among such promising looking candidates. Our Space Science group was interviewed and tested at JSC the second week of October.

"As it happened, these visits of applicants to JSC served a dual purpose: while NASA people were evaluating us, we were evaluating them and the astronaut program. There was a lot of contact between serving astronauts and applicants, some of it planned and some informal. Especially with the Space Science group, there was more than a little mutual mistrust. The astronauts viewed with some suspicion these pointy-headed, apparently unqualified applicants who had probably made it this far only because of political correctness in the NASA front office, and the applicants were often put off by the perceived chauvinism of gung-ho flyers, all of them male and white.

Fig 1.6: (left) Catherine and Bill Heacox on their wedding day in 1966. (right) Heacox at 14,000 feet altitude on Mauna Kea, on the Big Island of Hawaii, circa 1981 (Images courtesy of W. Heacox).

"On more than one occasion, I listened to an astronaut trying to impress what he took to be a mere academic with frightening tales of flying jets in death-defying situations, before telling him that I was quite experienced in such things – which probably didn't help my case for selection. But my favorite such story had to do with Sally Ride. As one of the few women in the group, she was subject to more than a little abuse from male astronauts, until one of them challenged her to a racquetball match. The semi-pro tennis player cleaned his clock, much to the amusement of the other male astronauts who – to their credit – thought the matter hilarious and treated Sally with some respect thereafter.

"But there were also astronauts who took seriously their responsibility to inform applicants as to the nature of the job they were applying for. I especially appreciated the many discussions I had with Bob Parker, an astronomer selected as an astronaut near the end of the Apollo era and who at that time had been serving for more than a decade without flying into space – a consequence of the shift from Apollo to the Shuttle. From him and others I was able to get some appreciation for the nature of an astronaut's career, which was mostly devoted to helping with vehicle and program development, and only partially with spaceflight itself. I was especially interested in the computer-controlled systems in the Shuttle since

I had some experience in computer control of telescopes, a field in which my alma mater (University of Hawaii) had been something of a pioneer during my graduate student days there. Had I been selected as an astronaut, I probably would have concentrated on this area of Shuttle development.

"As the week at JSC wore on, I became increasingly disenchanted with the prospect of a career as an astronaut. By this point my prospects as a career scientist were becoming promising – I was then employed as a post-doctoral scientist by the NAS, and working at the Goddard Space Flight Center – and it was becoming clear to me that I probably could not continue that career as an astronaut. Of equal concern was what I could see as the astronaut culture in NASA. On more than one occasion, our NASA guides made it clear that astronauts were expected to be cultural representatives to the public, and must conduct themselves appropriately. In my imagination, I could see stretching before me an endless array of Rotary lunches to attend in a blue flight suit, and publicity pictures on all occasions. As a rather private person, that prospect appalled. It was not going to be easy to balance that aspect with the enthralling prospect of flying in space – if I could ever get there. The example of Bob Parker's flightless years served as a cautionary tale (Bob did eventually fly in the Shuttle, several years later).

"Throughout this week of mutual examination, there was a palpable tension among the applicants: only a few of us (there were 20 in our class) would be selected as astronauts, if that. There was no real venue for outright competition; we just all tried our individual bests to impress the many people evaluating us. Toward the end of our week at JSC – filled with physical and mental examinations and interviews – the Astronaut Office sponsored a formal dinner for us applicants, at which Chris Kraft and John Young were invited speakers.

"I don't remember what Chris Kraft said, but John Young's speech greatly impressed me and has stuck with me all these years. He said that his talks with us individually had sensitized him to our collective anxiety about our professional futures. At that time, astronomy jobs were thin on the ground, and a large percentage of recent astronomy PhD graduates (as were many of the applicants in the audience) could not find positions in their field, let alone jobs as astronauts. He wanted to assure us that we had nothing really to worry about: he was personally impressed with every one of us, and anyone who could make it this far in the astronaut selection game had what it took to be a success in whatever they cared to take on. So stop worrying and get on with your lives – professionally, you're going to be fine. I was struck with what a gracious thing this was for the world's leading astronaut to say, and have been a John Young fan ever since. I was saddened by his recent death.

"On the last day of our week at JSC, George (Pinky) Nelson and I shared a dinner at a local restaurant. Part way through it, Sally Ride came in and joined us. She was depressed because her latest blood draw had been ruined somehow (the JSC

medical people were big on blood analyses, and all of us applicants were down a few quarts), so she not only had to stick around another day for a new blood draw and test but couldn't join Pinky and me in the bottle of Mateus we were sharing. We cheered her up as best we could, and finished the dinner promising to stay in touch no matter what the selection outcome was. But we never did; that was my last contact with either of them.

"Two weeks later, back in my office at the Goddard Space Flight Center, I wrote to the Astronaut Office to withdraw my application. It wasn't an easy decision to make, and I have had second thoughts on many occasions since. But there is no doubt in my mind that it was the right and prudent thing to do: I don't know if I would have been successful as an astronaut, but I'm pretty sure I would have been unhappy in that career. It was a poor match between job and applicant.

"Toward the end of November – nearly two months after the visit to JSC – I was called by the Astronaut Office and asked if I was still interested in the job. It was as if they had not received my withdrawal letter, or chosen not to acknowledge it; or perhaps it was just a functionary checking off items on a list. Whatever the case, I confirmed my withdrawal and have heard nothing further from JSC.

"About a month later, NASA announced its selections for the new astronaut group, including three from my finalist group: Jeff Hoffman, Pinky Nelson, and Sally Ride. I had been quite impressed with all three and was not surprised at their selection. Rumor had it within NASA – in which I was still installed at Goddard – that the initial selection decision had been rejected by NASA headquarters (or someone higher) as being insufficiently diverse, both racially and in terms of gender, and sent back to JSC for reconsideration. Could be. In my opinion, nearly all the finalists in my group were very impressive and would probably have done well as astronauts. It was a real privilege to be one of them, however briefly." **[11]**

OTHER CANDIDATE VOICES

Lawrence (Larry) Pinsky, PhD, MA, BSc, is still active in the space program. Currently a Professor of Physics at the University of Houston, he also works for NASA and CERN (the Geneva-based European Organization for Nuclear Research). In addition to his full-time teaching duties, he is also involved in research in the areas of space radiation simulation, relativistic and intermediate energy heavy ion physics, charged particle detector development for space radiation dosimetry, Grid Computing, and cosmic ray astrophysics.

Professor Pinsky was also in the sixth group of astronaut applicants and, like Bill Heacox from his group, he remembers the amazing prowess of fellow applicant Sally Ride in a session of racquetball.

Fig 1.7: (left) Professor Lawrence Pinsky in 2011 (Image courtesy of Gallerie Utef). (right) Dr. Wilton Sanders III (Image courtesy of Wilton Sanders III).

"One anecdote I recall is that we were given access to the astronauts' gym facilities, among other freedoms to roam around to get the feel of the Space Center. Since I had worked there previously, as had another of the candidates, we were not interested in exploring the ins and outs of the place, so we agreed to play some racquetball on one of the astronauts' courts. While we were playing, Sally Ride knocked and came in and asked if she could play a game of 'cut-throat' with the two of us. Not realizing her athletic past had included women's tennis in college, and I believe even some professional experience, we agreed. She proceeded to destroy both of us, leaving us as defeated sweaty lumps in our respective corners before bowing out as calm and composed as when she had entered, thanking us and saying she couldn't spare any more time because she had to go running! Needless to say, we were both very impressed, and her selection was clearly a very correct choice in the long run.

"Regarding the selection process, my application was ultimately rejected by the medical board because I have a congenitally high blood sugar baseline, which statistically predicted that there was a significant probability that I would develop diabetes later in life, but still within the time projected to have to remain qualified to fly. I still do not have diabetes, but no regrets. I believe the selection process was fair." **[12]**

When the time came for his participation in the interview process at JSC, Capt. Loren Shriver was on active duty with the USAF, based at the Flight Test Center at Edwards Air Force Base (AFB), California, and fully involved in test work with

the McDonnell Douglas F-15 *Eagle*. He reported to JSC along with the fourth group of 20 candidates on September 15, 1977.

"The week-long evaluation consisted of a number activities," Shriver recalled, "including a very thorough physical exam (much more included in it than our annual Air Force flight physicals), psychiatric evaluations, evaluations of new equipment NASA was developing for possible use, and the grand finale of an hour and a half or longer personal interview with a whole team of NASA personnel, any of whom could ask any question that came to mind. Oh, and interspersed throughout the week were 'social' events, or gatherings of other NASA personnel, mostly current astronauts, their spouses, and some other accomplished NASA Space Operations personnel.

"I have to say that it was a most interesting, exciting, stressful, and yes, kind of 'fun' week. For example, I had never really been evaluated [by], or talked with, a psychiatrist before, but during this week there were sessions with two different psychiatrists (Drs. Terry McGuire and Edward Harris), and it turned out to be pretty much one was the 'good guy,' (McGuire) and one was sort of a 'bad guy,' with the first asking just general questions and having a nice discussion, and the other (Harris) being more demanding and 'technical' in his approach, to see if I was easily flustered by his demands and questions. The 'social events' could have been easily dismissed by young fighter pilots, but I had decided that everything that happened during the week would be part of my 'interview,' so while being 'social' I was not going to overdo it or make a complete fool of myself, and I believe that was a good approach.

"I have to admit that the prospect of the interview with all the NASA folks and me was on my mind a good deal from the moment I knew I was going to Houston. Who would be there? What were they going to ask? How technical would it be? My actual interview turned out to be a series of discussions with the NASA participants about things they were interested in as we went along. It varied from quite technical questions and answers from me about my experiences, my flight test programs, the F-15, my specific favorite areas of flight testing, and all the way to how farming in Iowa had changed since my early days as a kid, and even the fact that I played fast pitch softball on a team at Edwards AFB! It actually was a very civilized, straightforward discussion of many topics of interest to everyone in the room." **[13]**

Dr. Wilton Sanders III is a senior scientist in the Astrophysics/Science Mission Division at NASA Headquarters in Washington, D.C. In the summer of 1977, he was one of the 208 astronaut finalists flown to JSC in Houston for the week of physical, mental, and other tests designed to determine if he was suitable to continue in that program. He was in the fifth group of 20 candidates to be tested and evaluated, beginning on September 26. In that group, 17 were Pilot candidates.

"Even though I was a Mission Specialist candidate, the bulk of my group were candidates not for Mission Specialist, but rather for Pilots... Consequently, most of the guys in my group were military pilots who were quite impressive physical specimens, although my roommate was Steve Hawley who eventually was selected

as a Mission Specialist. I have since spoken with Hawley to see if he remembers me, but he does not.

"In any event, it was a busy week, with every day booked with various tests and interviews. The physical tests ranged from chin-ups and sit-ups, at which the military pilots excelled, to cardio treadmill runs and lung capacity measurements. In my case, they also included eye tests. I am far-sighted and slightly cross-eyed and have little depth perception because my brain does not fuse the individual images from each eye. This condition seemed to fascinate the eye doctors and led to several follow-up examinations. There were also psych exams, interviews with two different psychiatrists whom we called Good Shrink and Bad Shrink, and claustrophobia tests where we were put inside a small inflated sphere for a while and told to evaluate it as an 'escape pod.' Towards the end of the week, there was a formal interview with a panel of five or six high-ranking somebodies, the only one of whom I remember was Chris Kraft. They seemed to focus on my lack of the '*Right Stuff*.' My father and brother were Navy pilots, but I had never flown a plane, or piloted a glider, or parachuted for fun, or climbed a mountain, or been scuba-diving, or apparently done anything dangerous or adventurous, so I guess they were concerned that I would chicken out at some inopportune moment. In the end, my rejection letter identified my eyesight as the reason for not being selected, and that is probably valid, but I have carried the suspicion that the lack of the '*Right Stuff*' was just as important.

"Overall it was a busy week, but not overly stressful unless you allowed it to be. There were some candidates who were so invested in being selected that they made it quite stressful for themselves. Others of us saw it as an adventure, a once in a lifetime experience, and just tried to get into it, enjoy it even." **[14]**

Fig 1.8: Anna Sims (later Fisher), undergoing trials on a treadmill

Twenty-eight-year-old Anna Sims (later Fisher) had recently undertaken her internship in the MD/PhD program at the University of California, Los Angeles (UCLA) when she first heard about the NASA call for astronauts through a colleague, Dr. Mark Mecikalski.

"He used to follow the space program avidly. He got all the NASA newsletters and all those things. I remember he had lunch with my then fiancé, later husband, Bill, and said, 'Hey, NASA is looking for people. You and Anna have always talked about how you're interested'. I remember Bill paging me over the loudspeaker system, getting his call, and saying, 'We have three weeks to apply before the deadline'. So we got our applications … In those days it wasn't an electronic application, it was just a regular civil service application that you filled out by hand. I remember where you put in the title, what you were applying for, and it was astronaut. It felt kind of weird. I think I got mine in the day before the deadline, because you had to get transcripts and all that kind of stuff. It was a pretty arduous process. So I got mine in maybe the day before the deadline. I think Bill got his application postmarked the day of the deadline.

"For me it was a real struggle in that time period, because we had both accepted surgical internship positions. Bill was a year ahead of me. At the last minute we sat down – well, not the last minute, but fairly early in the process of when you get your internship – and we talked about it. I said, 'Here I am. I'm going to be a surgical resident. Is that the kind of life I really want to lead where I'm going to be on call at all hours of the night?' We started having second thoughts even before the NASA application came along.

"So anyway, we decided to spend a year practicing ER [Emergency Room] medicine while waiting for a decision from NASA. We wound up practicing in emergency medicine for the year in Los Angeles while we were waiting to find out what happened, which was a really hard year. Just practicing emergency medicine in Los Angeles was a very challenging thing."

During their time in ER, Anna and Bill began making wedding plans. "We were just sitting there making plans and flight plans and all that sort of stuff when the phone rang. It was [someone] – I don't remember who called anymore, probably Duane Ross – asking if I wanted to come [for an] interview. This would have been on a Friday I guess, Thursday or Friday. Would I want to leave not that Sunday but the following Sunday and come for an interview? That was the week Bill and I were targeting to plan our wedding … We were sitting there and I said 'It's NASA. They want me to come [for an] interview'. He said, 'Say yes, we'll figure it out'. So I said yes.

"This was a Friday … We got married on Tuesday. We went to San Francisco for that night and came back the next day. I think I worked a shift on that weekend and another shift. It was supposed to be my tenth high school reunion that Saturday, and I really wanted to go. That was it. I just ran out of steam that Saturday night having to be ready to go the next day. I said, 'If I'm going to go for this interview, I've got to give it everything I have'. It's my only reunion that I missed for high

school, but they were very understanding as well. Then I got on a plane that Sunday morning. I was exhausted. Because I was so busy, I didn't really have time to think about the interview process, study, or research … All of a sudden, I realized, 'Jeez, I'm on my way to do this, and I really haven't researched it, other than I know I want to do this with all my heart'. So I'm going, 'Jeez, what have I gotten myself into?'

"I had my interview, and again my attitude on all of that was: 'NASA is this big entity that knows everything about you'. They already had done background investigations. I knew from some of my friends that people had come and talked to them. I just figured, 'Well, I'd better be honest'. I even remember saying, 'I want to have children, so if that's a factor in your selection, I definitely do want to have children'. I even said that at my interview. Then you leave. After you've been here for a week, then you really want it. Before, I was able to keep it at a distance, but those months from August till when they announced [the final 35] in January were probably some of the hardest months in my life." **[15]**

Thirty-five-year-old Major (later Colonel) Gary Matthes was a highly-trained test pilot and former combat pilot with the USAF, stationed at Edwards AFB, California. Hailing from St. Louis, Missouri, he was selected to attend the USAF Test Pilot School (formerly the USAF Aerospace Research Pilot School) at Edwards in July 1972, entering as a member of Class 72B. Following his graduation, he remained at Edwards in their Flight Test Center. During this time he was twice selected by the Air Force to try out for NASA's astronaut corps, a goal he had hoped to achieve since graduating from the Air Force Academy. The first such occasion was in 1977. He dared to dream of being selected, and the extensive medical test phase held few fears for him.

"Since I had taken the astronaut physical to get into Test Pilot School in 1972, I wasn't intimidated by it, as it was just what I expected," he recalled. "There were some additional 'measurements' taken that the doctor told me were more to expand the database for the future than to influence the selection process."

Ultimately, though, he did not make the final selection, but would try again three years later. "Frankly, my memories are very sparse and I don't think it is just because of my age. I have to admit that since I was interviewed twice, once in 1977 and then again in 1980, I may be combining the two experiences. One part of the process that did stay in my memory all these years was the interview with the psychologist. He was good at finding out just about everything about me, and upon our second meeting in 1980, he picked up where he had left off three years before. It was like a meeting of two old friends. I also recall that on the Friday night after the end of the process, George Abbey and some of the astronauts invited my applicant group to a pizza parlor for beer and pizzas.

"I remember when I got the call telling me that I had not been selected. I was told that I was in the top 20 and so would be very competitive for the next selection. Obviously, the results of that second interview were the same. I did apply one

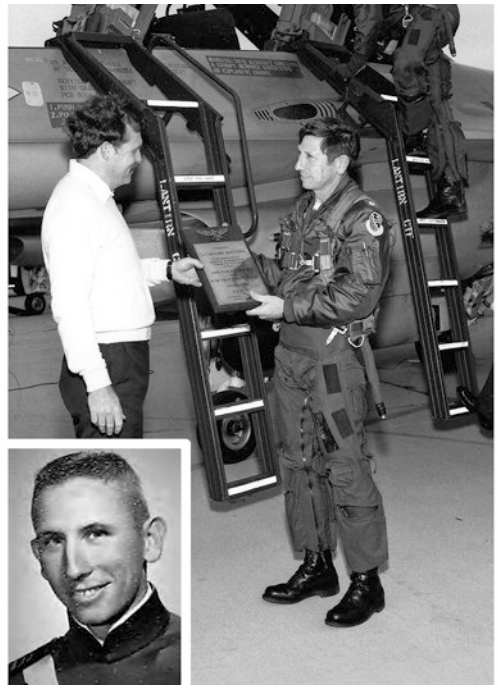

Fig 1.9: (inset left) USAF Academy Class of 1964 graduate Gary Matthes. (main) Circa 1983, Lt. Col. Gary Matthes is congratulated on having racked up more than 1,000 hours in the F-16 when he was director of the LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) test force. LANTIRN was a combined navigation and targeting pod system for use on the USAF's premier fighter aircraft. Initial operational tests and evaluations of the LANTIRN navigation pod were successfully completed in December 1984 (Images courtesy of Gary Matthes).

more time and my name was put forward by the Air Force, but NASA declined to interview me that time.

"Although applying to be an astronaut was a big thing back then, the process really didn't leave many lasting memories for me," Matthes said, summing up. "I have come to realize that not being selected was the best thing that could have happened to me. I love flying (still do) and I especially enjoyed test flying. Had I been selected as an astronaut, I would have missed out on some of the most exciting and challenging flying of my career.

"After the *Challenger* disaster, many of the military astronauts were returned to their military services. Roy Bridges returned to Edwards AFB as Commander of the 6510th Test Wing. I was his Vice Commander. He spent a great deal of time talking to me about the astronaut experience, especially about the politics within the group headed by George Abbey. If I had had any doubts about my great fortune in not being selected, Roy's insights blew them away. I could not have survived in that type of organization."

Gary Matthes retired as a colonel from the USAF in August 1992. Six months later, he joined the Lockheed Fort Worth Company (which became the Lockheed Martin Aeronautics Company) as a project manager on the Greek F-16 Program. He subsequently became involved in managing F-16 programs for the USAF. He retired from Lockheed Martin at the end of 2006, and still enjoys the recreational pleasures of flying light aircraft.

TABLE 1.2: GROUP 8 SELECTION BOARD MEMBERS

CHAIRMAN:
George W. S. Abbey – Director of Flight Operations, JSC

RECORDER:
Jay F. Honeycutt – Assistant to Director, Flight Operations, JSC

PILOT PANEL:
John W. Young – Chief, Astronaut Office, JSC
Vance D. Brand – Astronaut
Martin L. Raines – Director of Safety, Reliability, and Quality Assurance
Joseph D. Atkinson – Chief, Equal Opportunity Programs Office, JSC
Jack R. Lister – Personnel Officer, JSC
Donald K. Slayton – Manager for Approach and Landing Test, JSC

MISSION SPECIALIST PANEL:
Dr. Joseph P. Kerwin, MD – Chief, Mission Specialist Group, Astronaut Office, JSC
Dr. Robert A. Parker – Astronaut, Mission Specialist Group
Dr. Edward G. Gibson – Astronaut, Mission Specialist Group
Dr. Carolyn L. Huntoon – Chief, Metabolism and Biochemistry Branch, Space and Life Sciences Directorate, JSC
Joseph D. Atkinson – Chief, Equal Opportunity Programs Office, JSC
Jack R. Lister – Personnel Officer, JSC
Dr. James H. Trainor – Associate Chief, High Energy Astrophysics Laboratory, GSFC
Robert O. Piland – Assistant Director for program development, Engineering and Development Directorate, JSC

Candidates as 'Guinea Pigs'

At the time of his candidacy as a Mission Specialist, Frank Harnden, Jr. was a research astrophysicist for the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts. Forty years on and recently retired from his work as a Principal Investigator at CfA (and NASA), he still has many recollections of that time.

"One particularly fond memory is that of meeting Sally Ride. Like mine, her graduate work was in X-ray astronomy. They put all the candidates up (20 per week) in the same hotel, and Sally was billeted in the room right next to me. We walked back and forth together quite a bit."

Dr. Harnden, who was in the sixth group of candidates, also recalls the experience of two psychological tests. "The 'shrink' had a typical psychologist's office but with a somewhat disturbing difference. Although the upholstered armchair we were invited to sit in appeared normal, it wasn't; the whole chair was unusually large. It was so wide that one could not rest both arms on the chair simultaneously. And it was so high that one's feet did not reach the floor but instead dangled off the front. Presumably, we guinea pigs were expected to strike a 'passable' response to this awkward situation. The other psych test was more fun: we got to choose a favorite song and favorite animal. My favorite song was Gordon Lightfoot's 'Canadian Railroad Trilogy' and favorite animal, a seagull – I'd recently read Richard Bach's account of Jonathan Livingston Seagull's flying." **[16]**

Fig 1.10: (main) Guion Bluford demonstrates how he squeezed into the rescue ball during his psychological evaluation tests. (right) Dr. Frank Harnden Jr., circa 1980 (Image courtesy of Frank Harnden Jr.).

One potentially daunting test the candidates had to endure – as earlier related by Dr. Sanders – was NASA's Personal Rescue Sphere. A spherical enclosure known simply as the "*rescue ball*," the device had been developed for any possible emergency transfer of astronauts between Shuttle vehicles[2]. Once described as a

[2] Formally known as the Personal Rescue Enclosure (PRE), although it was used in astronaut selection processes for many years, none ever flew on a Shuttle mission. **[17]**

claustrophobic's nightmare, the 36-inch (86-cm) diameter sphere had one tiny window to prevent total sensory deprivation. The endangered astronaut would clamber into the ball, squeeze up into a fetal position and don an oxygen mask, ready for crewmembers to zip it up and place the sphere into the depressurized airlock, from where they would be transported across to the rescue Shuttle by a space-suited astronaut. **[18]**

As part of their psychological testing, the astronaut candidates were required to be zipped into a rescue bag for an undisclosed period to see how they would cope, although they were given the impression that it was an exercise in which they were to evaluate the sphere as an escape device and submit a report on it.

"At barely 5' 9", I typically faced handicaps, e.g., in high school football (though not in college gymnastics)," Harnden reflected. "When it came to this test, however, I had a definite advantage. I had no trouble curling myself into the three-foot, utterly dark (and quiet) beach ball, whereas my colleague Jeff Hoffman was about six feet tall and must have been extremely cramped. Those running the test refused to tell us how long it would run. Instead they gave us a headset and said we should request termination if we 'wanted out.' I don't know how long it lasted, but it was actually quite a pleasant experience."

Unfortunately for Dr. Harnden and fellow science candidate Wilton T. Sanders, the Astronaut Office eventually rejected both men, citing their lack of binocular vision. As Harnden explained, this was "amblyopia (sometimes called 'lazy eye') that wasn't corrected early enough to enable our brains to fuse the images from our two eyes."

It proved to be a difficult time for Frank Harnden. "I received my rejection phone call the day after Super Bowl Sunday, 1978. Even though my team had won (I grew up in Dallas), the NASA news sent me into a severe bout of depression. It took me several weeks to recover from it, but that one episode has fortunately remained my only experience of such darkness. The successful launch the following November of NASA's Einstein X-ray Observatory (for which I served as one of its Instrument Scientists) also helped me put my astronaut disappointment behind me." **[16]**

Dr. Joseph K.E. (Ken) Ortega was in the final group of 24 candidates called to Houston. Ken is a Professor Emeritus of the Department of Mechanical Engineering at the University of Colorado, Denver. He holds a PhD, MSc and BSc degrees, all from the University of Colorado, Boulder, and all in Aerospace Engineering.

"I remember how excited I was when I received written notification inviting me to fly to Johnson Space Center for interviews and tests," he recalled. "This was my dream coming true. I had dreamed about being an astronaut since I was in middle school during the Mercury program. Growing up on a small ranch in the small coal mining community of Sarcillo in southern Colorado, it did not appear to me that I could have a chance to become a NASA astronaut. But I put in motion a plan

to try. The plan would address educational and physical qualifications. I began to run three miles a day (rain or shine), did 90 pull-ups a day (three sets of 30), 150 push-ups a day (three sets of 50), 150 sit-ups a day (three sets of 50), and began a weight-lifting program.

Fig 1.11: (inset) Dr Joseph (Ken) Ortega. (main) Wearing Deke Slayton's Apollo space suit (Images courtesy of Ken Ortega).

"I applied for and was accepted into an Aerospace Engineering program at the University of Colorado, Boulder. I graduated with a BSc degree and during that time I conducted research that I published later with my advisor in *Science* (*Science* and *Nature* are the top scientific journals in the world). Afterwards, I became a Missile Launch Officer in the USAF and won first place in the four basic (4 BX) exercise program, beating out at least 500 officer training candidates. The Air Force sent me back to complete my MSc degree in Aerospace Engineering at CU Boulder. After an honorable discharge from the USAF, I obtained my PhD in Aerospace Engineering, CU Boulder, doing my thesis in Bioengineering. Subsequently, I did a three-month post-doctorate in Biochemistry and then a one-year post-doctorate in Turbulence Fluid Mechanics before I went to work for Martin Marietta Aerospace in the Thermo Physics Department. It was my idea to get research experience in diverse fields to prepare me for a Mission Specialist position.

"I was a Senior Engineer at Martin Marietta when I was invited to fly to JSC. Boy, I was flying high [very excited], and my wife, Alice, was happy for me. At JSC, we were organized into small groups of about ten people. We met with Astronaut John Young, whom we thought 'walked on water.' We were introduced to different aspects of the Space Shuttle program and had an opportunity to observe the Space Shuttle simulator in action. Embedded in these activities were trips to various medical doctors and their staff. We did pull-ups, push-ups, and other physical exercises. They measured various body functions and gauged our psychological aptitude and perspective. I remember a psychologist asking me, 'If you were an animal, what animal would you like to be?' My response was, 'a dolphin.' He then asked why, and I responded that they were very intelligent and I thought they might perceive and understand their surrounding better than other animals. I later discovered that most of my colleagues had said that they would want to be an eagle, so they could fly high and fast.

"The best part of my visit was getting into Mercury astronaut Deke Slayton's Apollo space suit. I was beginning to believe that my dream was becoming a reality. The worst part was the return visits to the doctor for blood pressure tests. In the back of my mind, I was becoming suspicious that something was not going as planned. However, after I returned home, I was still very optimistic. So later, when I received notification that I did not make the final cut, I was devastated. I was very depressed for months subsequent to the notification. I was informed that my blood pressure was high and I should have it checked by my doctor. I did and I have been on blood pressure medication ever since. I was sabotaged by my body.

"Subsequently, I worked as a Group Manager and Principal Scientist at the Solar Energy Research Institute (which later became the National Renewable Energy Laboratory) and then I became a faculty member at the University of Colorado, Denver, in the Department of Mechanical Engineering. During the first part of the 1980s, even though my career was progressing well, it felt as if a dark cloud was over my head – the sun was not shining. As a young Assistant Professor, I met with Ellison Onizuka at CU Boulder. Ellison was now an astronaut with one Space Shuttle mission under his belt. Ellison and I were undergraduates in Aerospace Engineering at the same time, and we double-dated with our respective soon-to-be wives. Alice and I attended Ellison and Lorna's wedding. I remember the mixed emotions I felt as I spoke with Ellison. I was happy for him that he made it and was now an astronaut, but my dark cloud, which was becoming less dark, got darker again.

"On one unforgettably awful day, I was at a Gordon Research Meeting in Santa Barbara, California. Before the morning meetings on January 28, 1986, I had informed a few of my colleagues that my friend Ellison Onizuka was scheduled to lift off that day. During one of the talks, one of my colleagues told me that I should go watch the TV right away. On the broadcast, they were rerunning the tape of the Space Shuttle *Challenger*'s lift-off. The terrible *Challenger* accident added another

ingredient into the mixed emotions I was having. I remember thinking about the family Ellison left behind, and I thought about my wife and two daughters and what it would mean to them if I were on that flight. In the subsequent years, these sobering thoughts helped me to shed the dark cloud over me. Recently, I retired after 35 years as a faculty member. Now the sun shines for me and I believe that a career of research and teaching as a professor was my true calling in life." **[19]**

THE THIRTY-FIVE NEW GUYS (TFNG)

By Monday morning, January 16, 1978, the applicants who were still hopeful of being selected had received the long-anticipated phone call, which in most cases came very early in the morning. For those who had been selected, the call came from George Abbey, then chief of the Flight Crew Operations Directorate (FCOD), the division of NASA at JSC that included the Astronaut Office. Phoning from his office on the eighth floor of Building 1, he simply asked if they were still interested in coming to JSC as an astronaut. Following their acceptance, they were asked to keep the news strictly secret until at least noon. While most of the successful candidates were scattered across the United States, two of the calls were to overseas numbers: Kathy Sullivan was finishing up her doctorate work in Halifax, Nova Scotia, while Steve Hawley was engaged in post-doctoral research studies in Chile. A direct phone call could not be made to Dave Walker, who was serving as an F-4 *Phantom* pilot aboard the aircraft carrier USS *America* (CV-66) in the Mediterranean. Contact was eventually achieved and he accepted. At the same time, the unsuccessful candidates received a phone call from a member of the selection panel.

According to later, widely-spread reports, there were some last-minute changes to the make-up of those initially selected when it was revealed that only one woman had made the cut. The story stated that five pilots were subsequently dropped from the list and replaced with five women Mission Specialists. This would have been a rather curious anomaly on the part of the selection panel and is not borne out by the facts. Initially, NASA JSC was authorized to choose 40 new astronaut candidates for the 1978 selection, consisting of 20 Pilots and 20 Mission Specialists. By around November 1977, the interviews and selection had progressed to some sort of tentative list. It was then that NASA Administrator Robert Frosch and the Associate Administrator for Manned Space Flight, John Yardley, looked at the Shuttle schedule and the number of unflown pilots still waiting for assignments, including those transferred to NASA from the Manned Orbiting Laboratory (MOL) group. They decided that the agency did not need quite as many new Pilot candidates. Consequently, Kraft and Abbey were instructed to cut the number of pilots down to 15. This administrative decision had no bearing at all on the number of women selected.

Not surprisingly, the five pilots dropped from the list made it into the next draft of astronaut candidates in 1980. As there were six unsuccessful pilot applicants in the (overall) 208 interviewed at JSC who made it in to the 1980 group selection, it is uncertain which one was not among the five taken off the list of successful candidates in 1978. The six pilots were John Blaha, Roy Bridges, Guy Gardner, Ron Grabe, Bryan O'Connor and Richard Richards. Bryan O'Connor later said: "[As] I look back, I don't think I would have flown the Shuttle any sooner had I been picked up in that first class… They were going to hire 40 and they cut five pilots out, because they didn't need them, right at the last minute. I found out much later that I was one of those five. The reason they didn't need them is because in that '78 time-frame, the *Columbia* [Orbiter] was having problems. All the tiles had fallen off on a flight across country, one of the main engines had blown up on a test stand, and the whole Shuttle program was slipping.

"So if they had picked me up in 1978 and I had joined the Astronaut Office, I probably would have eventually flown the same time as I did anyway… I figured [it would give me] a couple more years of flight test experience, and if I scored fairly high among this [1978] group… they got hired by NASA, so I don't have all those people in front of me anymore, so maybe I'll be [more] competitive next time. And, sure enough, I applied in 1980 and I was picked up that time." **[20]**

Dr. Rhea Seddon was one who received the call directly from George Abbey, while working as a surgical resident at the VA Hospital in Memphis, Tennessee. Despite being initially stunned by the news, she was quick to accept. As she later recalled, "I would soon meet the other 34 astonished selectees who received the same call that day. They would become my close friends, my crewmates, my team; one would turn out to be my life partner and father of my children. That day, January 16, 1978, would become for all of us '*Who, me? day*', the date our lives changed forevermore." **[21]**

Capt. Jerry Ross of the USAF was a Flight Test Engineer with the B-1 bomber program at Edwards AFB, and one of many military personnel based there waiting on that all-important phone call. When it came, it was not the good news he had been hoping for, as he recalled in his 2013 book, *Spacewalker*: "I finally got my phone call. It was from Ed Gibson, who had flown on the final Skylab mission. I don't remember what he said, but it hurt… I was so close. I thought I had achieved my goal, but then it was snatched away.

"Six flyers at Edwards got calls from Mr. Abbey. Test Pilot School classmate Brewster Shaw was selected. Ellison Onizuka was also on the list. He was an instructor at Test Pilot School, and we played on the same softball team. El and I had gone to Houston together for our interview week. Another softball teammate, and a Purdue graduate, Loren Shriver got the call. The other three were Air Force test pilots Dick Scobee and Steve Nagel and Army test pilot Bob Stewart… When I saw my friends leave for Houston, it was hard." **[22]**

Although Jerry Ross had missed out, George Abbey encouraged him to apply again, and he was subsequently selected as a Mission Specialist in the Group 9

astronaut intake. When he eventually retired from NASA in 2012, Col. Ross had been launched into space seven times. On his final mission, STS-110 in April 2002, he became the first person to complete seven space flights – a record that stood for just two months before it was equaled by Franklin Chang Díaz on the following STS-111 mission. Over his seven flights, Jerry Ross had accumulated 1,393 hours in space, of which 58 hours and 18 minutes were invested in an impressive total of nine spacewalks. [23]

Fig. 1.12: Photo montage of the 35 successful candidates of NASA's Astronaut Class of 1978.

On that Monday afternoon, January 16, with all the acceptances now registered well before the 13:00 deadline, NASA Administrator Robert Frosch was finally able to announce the names of those chosen for the space agency's eighth group of astronauts. There were 35 names in all – made up of 15 Pilot and 20 Mission Specialist astronaut candidates. The group comprised 14 civilians and 21 military officers. Six of those chosen were women, and four were minorities. They were named as:

Pilot Ascans
Daniel S. ("Dan") Brandenstein, Lieutenant Commander, USN, age 34
Michael L. ("Mike") Coats, Lieutenant Commander, USN, age 32
Richard O. ("Dick") Covey, Major, USAF, age 31
John O. ("JO") Creighton, Lieutenant Commander, USN, age 34
Robert L. ("Hoot") Gibson, Lieutenant, USN, age 31
Frederick D. ("Fred") Gregory, Major, USAF, age 37
Stanley David ("Dave") Griggs, Civilian, age 38
Frederick H. ("Rick") Hauck, Commander, USN, age 36
Jon A. ("Jon") McBride, Lieutenant Commander, USN, age 34
Steven R. ("Steve") Nagel, Captain, USAF, age 31
Francis R. ("Dick") Scobee, Major, USAF, age 38
Brewster H. Shaw, Jr., Captain, USAF, age 32
Loren J. Shriver, Captain, USAF, age 33
David M. ("Dave") Walker, Lieutenant Commander, USN, age 33
Donald E. ("Don") Williams, Lieutenant Commander, USN, age 35

Military Mission Specialist Ascans
Guion S. ("Guy") Bluford, Jr., Major, USAF, age 35
James P. ("Jim") Buchli, Captain, USMC, age 32
John M. Fabian, PhD, Major, USAF, age 38
Dale A. Gardner, Lieutenant, USN, age 29
Richard Michael ("Mike") Mullane, Captain, USAF, age 32
Ellison S. ("El") Onizuka, Captain, USAF, age 31
Robert L. ("Bob") Stewart, Major, U.S. Army, age 35

Civilian Mission Specialist Ascans
Anna L. Fisher, age 28
Terry J. ("TJ") Hart, age 31
Steven A. ("Steve") Hawley, PhD, age 26
Jeffrey A. ("Jeff") Hoffman, age 33
Shannon W. Lucid, PhD, age 35
Ronald E. ("Ron") McNair, PhD, age 27
George D. ("Pinky") Nelson, age 27

Judith A. ("JR") Resnik, PhD, age 28
Sally K. Ride, age 26
Margaret ("Rhea") Seddon, MD, age 30
Kathryn D. ("Kathy") Sullivan, age 26
Norman E. ("Norm") Thagard, MD, age 34
James D. ("Ox") van Hoften, PhD, age 33

The Stats

Candidates in previous selections had mostly been aged in their 30s, which had allowed them time to acquire sufficient educational attainments and work experience, and normally to get married and have a young family. This tended to yield well-balanced, educated and settled individuals, and at the same time portrayed the image of the clean-cut, dedicated and patriotic American military pilot or academic professional, which helped establish the "*Right Stuff*" ethos in the Astronaut Office from the late 1950s and throughout the 1960s.

By the mid-1970s the iconic image of "The Astronaut" had wavered a little, with several departing the program having been unable to adjust to the lifestyle, disenchanted with the reduction in available missions and the lack of clear direction, or having endured the breakup of their families under the strain of living the role. By the time the 1978 group joined the Astronaut Program, both the formula and the agency had changed, with the former era of *All-American Boys* now a thing of the past as a new generation of *All-American Astronauts* began to come to the fore.

The 15 pilots had been selected from 659 applicants, of which 147 were military and 512 were civilian (eight were women and ten were minorities). The 20 Mission Specialists were chosen from 5,680 applicants, of which 161 were from the military and 5,519 were civilians (1,251 were women and 338 minorities).

While the majority of the new group was once again in their 30s, there were eight who were in their 20s. They were a talented mixture of individuals with credible flying and academic credentials. The selection net had been spread wider, with the youngest candidates aged 26 (Steven Hawley, Sally Ride and Kathryn Sullivan), and the oldest aged 38 (Dave Griggs, John Fabian and Richard Scobee).

At the time of their selection to the astronaut program, 29 of the 35 were married, with all but three of these (Ron McNair, Anna Fisher and Steve Nagel) having children, though in time those three would also become parents. Over four decades later, many are still married to the same person, but inevitably some in the group divorced, some re-married and a few also experienced tragedies within the family. The six single members at selection were John Creighton, Steven Hawley, Sally Ride, Judy Resnik (divorced), Rhea Seddon and Kathryn Sullivan, with all but Resnik and Sullivan marrying in later years.

Fig 1.13: The next generation of America's astronauts. Seven years after Apollo 15 carried an Air Force crew to the Moon in 1971, Guion Bluford in USAF uniform stands next to *Endeavour*, the Apollo 15 Command Module (Image courtesy USAF).

A new era dawns in the Astronaut Office

By 1978, NASA was 20 years old. In the agency's first ten years, 66 astronauts (49 with a prominent piloting background and 17 being primarily scientifically trained) had been chosen in six groups. As the new group of 35 were to begin their basic training program, so the agency was preparing to celebrate the tenth anniversary of the Apollo 8 mission around the Moon during Christmas time in 1968.

It seems hard to imagine today, but barely ten years separated the achievement of Apollo 8 and the selection of the first astronaut group to fly the Space Shuttle. So much had happened, and indeed changed in those ten years. The agency had been committed, by Presidential decree in 1961, to land a man on the Moon within a decade, achieving it at the first attempt and with a year to spare. But in its second decade, NASA was forced to distance itself from reaching for the Moon, which it had prioritized during 1960s.

Now, in the later 1970s during austere times for human space flight, the desire was to look back at Earth instead of striving for missions deeper into space. Looking beyond Skylab, America's first national space station, and pioneering international cooperation with the Soviets on Apollo-Soyuz, it was time to develop better ways to access and utilize space, discarding one-shot rockets and single-mission spacecraft. That was both the beauty and the downfall of the Space Shuttle; in the

promise of being the all-encompassing national space launch system, but in the end falling far short of that goal. Once in orbit, the Shuttle Orbiter performed beautifully with relatively few failings, though maintaining the vehicles and getting them into orbit and back again on time and safely was always a challenge, one which proved fatal for two crews. But early in 1978, all this was in the future. The Shuttle had only flown off the back of a jumbo jet and had yet to prove it could fly in space, let alone repeatedly. However, after the lack of an astronaut in orbit since Apollo, there remained optimism and the hope of a new beginning for American human space flight, and while still untrained and unproven, at the forefront of that optimism were the 35 members of the astronaut Class of 1978.

Americans had not ventured into space for three years. Previously, only two calendar years had passed without an American in space since 1961: between the Mercury and Gemini programs in 1964; and in the aftermath of the loss of the Apollo 1 astronauts in 1967. This third lull in American spaceflight was the longest since the era of human space flight had begun in 1961. It had also been over a decade since the last NASA (and the second scientist) astronaut selection of 1967.

At the time of the announcement of 35 new astronaut candidates, the agency had an active roster of 17 Pilot and 10 Scientist astronauts from the earlier groups, many of whom had yet to fly their first mission and with some on leave of absence in other temporary roles while the Shuttle was being developed. The number selected in January 1978 had been worked out with a view to supplement the veteran astronauts, forming early Shuttle crews following the Orbital Flight Tests.

But how did the definition of a 'Shuttle crew' emerge? What impact did these new, very different and diverse individuals make on the established traditions and hallowed halls of the Astronaut Office in Building 4 at JSC? These questions are explored in Chapter 2 and Chapter 5.

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