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Reflections

"I hope that I see humans back on the Moon in my lifetime,
and perhaps on Mars, but I don't know now.
It's looking increasingly unlikely that that will happen,
but it's a matter of time."
NASA JSC Oral History Project, July 19, 2002
Donald E. Williams (1942-2016)

In the words of the late Don Williams, whether we will be lucky enough to be able to witness significant events that await us in the future is "a matter of time". The same could have been said for all 35 members of the Class of 1978 when they entered the NASA Astronaut Program as young, eager rookies, with their hopes and expectations for the future, as well as uncertainty and probably a little trepidation as they embarked on their great adventure together as a group. Over four decades later, the achievements of the Class of 1978 are now consigned to the history books, and though all flew in space, which is an achievement in itself, unfortunately none of them experienced the International Space Station (ISS). It is possible that some of them will be able to see the hopes of Williams fulfilled, with a return to the Moon and maybe on to Mars. After all, it's just "a matter of time."

A MATTER OF TIME

The study of history, according to the dictionary, is the "continuous, chronological record of important events," or the "study of past events," while making history is defined as "doing something memorable which influences the course of history." **[1]**

D. J. Shayler, C. Burgess, *NASA's First Space Shuttle Astronaut Selection*,
Springer Praxis Books, https://doi.org/10.1007/978-3-030-45742-6_14

Clearly, most achievements in the exploration of space fall under such definitions, even if those who participate in making history consider their input at the time to be simply doing the job they trained for rather than "doing something memorable." Over six decades into the 'space-age', each day in a given year can add to the roll-call of significant events in the annals of space history, and since 1961 and the pioneering one-orbit flight of cosmonaut Yuri A. Gagarin in Vostok, the human exploration of space has certainly created its own pages in the history books. Certain dates remain memorable in one's life, and for those lives that have been interwoven with human space flight, their personal memories can often be celebrated alongside milestones in space history.

In 1978, for the Thirty-Five New Guys (TFNG), the date of January 16 was one such key milestone, and the date on which they officially became known around the world as NASA's eighth group of astronauts has shared its significance with other moments in human space history across the years. For example:

- On January 16, 1969, Soviet cosmonauts Yevgeni Khrunov and Alexei Yeliseyev spacewalked from the Soyuz 5 they had launched in across to the docked Soyuz 4 they would return home in, completing the first Soviet Extra-Vehicular Activity (EVA) for nearly four years.
- In 1976, exactly two years before the TFNG were revealed to the world, a crew module arrived at Rockwell's Palmdale facility in California for assembly as Orbital Vehicle 101, later known as Orbiter *Enterprise*.
- Earlier on the very same day as the Class of 1978 were paraded in front of the press, the Soviet Soyuz 26 Descent Module landed, with cosmonauts Vladimir Dzhanibekov and Oleg Makarov returning from a one-week visit to the Salyut 6 station, having exchanged the older Soyuz 26 with the fresher vehicle Soyuz 27 they launched in.
- In 2003, as the Class of 1978 celebrated their silver jubilee, the crew of *Columbia* was launched on the ill-fated STS-107 mission.

Regardless of all the other anniversaries, celebrations and memories, however, it is January 16, 1978 that meant the most to the individuals who were named America's latest astronauts on that day, one of whom – Michael Coats – also celebrated his 32nd birthday with added pride. There would be other memorable dates for the TFNG of course, such as June 29, 1978 when they arrived at NASA's Johnson Space Center (JSC) for the Ascan training program. Or August 31, 1979, when they officially ceased being Ascans and received their Silver Pins. Then there were the individual days on which each of them entered space for the first time (or the second, third, fourth, or fifth time) and the days they each returned safely to Earth. Or the time they were awarded the NASA astronaut Gold Pin. Alongside these good days there were the bad days of course, with January 28, 1986 being foremost of the 'dark times' when the group lost

seven colleagues and friends including four of their own. But amid all the highs and lows, that 16th day of January in 1978 will always remain very special to each of them.

2018: A RUBY YEAR

Fig. 14.1: The official 40th anniversary emblem designed by Tim Gagnon and Jorges Cartes. The Earth is taken from the STS-7 emblem, the first mission with TFNG crewmembers, while the Shuttle stack is taken from the STS-8 launch honoring Guion Bluford's involvement in the original emblem. The Sun was updated and a spiral galaxy added to honor astronomer Steve Hawley, the last TFNG to fly in space. The ten stars honor the both the ten stars on the original emblem and the 10 TFNG who were deceased at the time the patch was designed. The number '40' is ruby red to acknowledge the milestone and the class acronym 'TFNG' is colored in silver and gold to signify the transition from silver to gold Astronaut Pins when they fly (Image courtesy of Tim Gagnon and Dr. Jorge Cartes, used with permission).

With Anna Fisher, the last remaining member of the class, leaving the agency in 2017, the next January 16 in 2018 was the first in four decades without any of the group still at NASA to mark the anniversary of their selection. Ironically, that year was also the Ruby Anniversary of the group's selection, a momentous event that just had to be celebrated. It was just done a little early, on December 14, 2017, when most of the surviving members of the selection and their spouses attended a reunion in Houston. According to Rhea Seddon, the timing was due to another event that most of the group wanted to attend: "Our 40th was done in December because the All Astro[naut]s Reunion was being held then and rather than all of us traveling twice we decided to do ours then attend the other." **[2]**

Time marches on for all of us, even for the youthful Class of 1978, as author and TFNG Mike Mullane eloquently observed of the reunion on his website: "As it is for all attendees at a class reunion, we see our age in the changes of others. I was certainly reminded of mine. Gravity had replaced the sculptured hardness of our youth with sags and lumps. Hairlines were galloping in retreat… or missing altogether. Faces were etched with the arroyos of age. Hearing aids were de rigeur. Reading glasses were holstered in pockets, ready for a quick draw when the menu came." **[3]**

After dinner, a slide show highlighted milestones in the Class of 1978 saga, with Rick Hauck taking the lead for a series of heartfelt toasts to the ten colleagues forever absent. The guests of honor at the dinner were Apollo and Skylab astronaut Alan Bean, who had been their mentor during their Ascan year, and former Director of Flight Crew Operations at JSC, George Abbey, who was also a member of the selection board that chose them and, according to Mullane, considered the "father of the TFNG." Abbey gave a reflective speech, "kind of making the point that we [as a group] had helped to shape the Shuttle program," according to Steve Hawley. **[4]** According to Mullane, Abbey told them how proud he was of them all and that, given a second chance, he would not change any of his selections. The next evening, the group attended the all-astronaut reunion, with many attending from other selections including the latest dozen Ascans chosen in the Class of 2017 (Group 22 "The Turtles")[1], in whom Mullane recalled the youth, passion and determination of himself and his peers.

Looking back over their careers in the Astronaut Office, many of those in the TFNG collective shared some of their most memorable moments.

[1] It must have been sobering to the TFNG who attended the all-astronaut reunion that all but three of the 12 "Turtles" were born *after* 1978, with the youngest born a decade after the Class of 1978 had been selected and after all of them had flown in space.

Fig. 14.2: The TFNG 40th anniversary reunion, December 2018. [Front l-r] Shaw, Fisher, Seddon, Hauck, Nelson, Sullivan, Hart, Thagard, Shriver, Lucid and Mullane. [Rear l-r] Gibson, Covey, McBride, Creighton, Brandenstein, Bluford, van Hoften, Fabian, Hoffman, Hawley and Coats. Not featured in the image: Gregory, Buchli, Stewart (Image from the collection of Rhea Seddon, used with permission).

A 'throwback mission'

In 2019, Steve Hawley was reminded he had been the final member of the selection to fly in space, two decades earlier, and was asked to reflect on how much had changed over the 16 years between the first flight of the TFNG in 1983 and the last on STS-93 in 1999. "Ironically, STS-93 in a sense was sort of a throwback mission, because if you look at what we were doing in those days, certainly over time, the missions became more and more complex, more and more difficult, [and] we took on more and more mission objectives. I always said early in the program [that] we held back a lot of margin on behalf of the crew, and as we got more experience and more mature in the program we started to give up some of that margin for the accomplishment of the mission. But 93 was a five-day mission where we deployed a satellite, [like] back in the old days, so it was a little bit of an [outsider] at the time. For me it felt kind of familiar, but I would say that in the 16 years from launching satellites to servicing Hubble Space Telescope, [and] building ISS, I think we realized a lot of the potential that we had always said that the Shuttle represented. I would like to think that our group helped that, first of all because there were enough of us to be involved in maybe more aspects of the program than could be done by a smaller astronaut core, which brought the astronaut prospective to different activities and also allowed the Astronaut Office to know what was going on maybe a little more broadly.

"I used to joke about this, although I think there is truth in it, that people would say 'Was it a culture change when your class was selected because you had women and minority astronauts for the first time?' I would usually say 'Yes'. I mean, there was certainly a culture change but I felt that the biggest culture change was the introduction of civilians into what was really a military structure to the Astronaut Office. The way I described it was that if you give a pilot a procedure, the first thing a pilot will do is learn how to execute it. You give it to a scientist and they will look at it and say, 'Yeah, well you know, I don't think that's the way I would have written it'. And that combination, I think, led to the ability to identify things that we could improve. And sometimes we were sent packing, and sometimes we weren't, while getting the improvements implemented." Hawley accepted that when they first entered the Office, there was perhaps a sense of breaking the barriers of the traditional Astronaut Office genre to establish their own credentials, which was one of the reasons they were selected in the first place. "I felt it was, but maybe not everybody felt it was that way. But I think legitimately there were questions, particularly about the civilian scientists, and the questions were of the form, 'Are these guys really capable of being operational?' In fact, when I was on the selection board, that was one of the hardest things to evaluate. I mean, if you're hiring a pilot, a military test pilot or military flight test engineers, there is no doubt that the guy is operational because he has had to do that. But if you hire a guy fresh out of grad school, somebody like Pinky [Nelson] or me or Sally [Ride], will they be able to develop a kind of operational mind set to make it successfully as a crewmember? I think people sort of assumed, until we proved we could do, or weren't capable, or at least maybe they were skeptical about it. One of the things I tried to

do early in my career, when I got assigned to SAIL [Shuttle Avionics Integration Laboratory], the software verification lab, was I wanted to learn as much as I could about the software, about how it worked, and that allowed me, not only in testing but later on in training, to demonstrate that I had some operational skills." **[4]**

REFLECTIONS FROM THE CLASS OF '78

One of the most useful resources for a space historian is the chance to interview key individuals about their participation and achievements in the program, but it is often impractical to get to interview all the people you would like to speak to in person. This is where the official Oral Histories are invaluable, and the archives of these interviews are a gold mine of information for the researcher. Throughout this trio of cooperative titles, as well as all the other titles the authors have penned, first-hand interviews remain the paramount and most precious source, but the archive of Oral Histories can be a useful and informative back-up option. Fortunately, NASA has recognized that this is a valuable resource and has created an online catalogue of interviews under the NASA JSC Oral History Project. Readers are encouraged to browse the treasure trove of information within these interviews. **[5]**

JSC Oral History Project

This project was established at NASA JSC in Houston in 1996, with the goal of capturing "history from the individuals who first provided the country and the world with an avenue to space and the Moon." Oral History interviews began in 1997, and in the two decades since then almost 1,000 individuals have participated. These include managers, engineers, technicians, doctors, astronauts and other employees of NASA and aerospace contractors who served in key roles during Project Mercury, Gemini, Apollo, Skylab, Space Shuttle, and more recently in the Shuttle-Mir Phase 1 program (including a number of Russian participants) and the ISS project. Within these archives are 54 interviews by 26 of the TFNG between 1998 and 2016. Those still awaited (if they have been, or plan to be conducted) are interviews with Jim Buchli and Bob Stewart, with hopefully further sessions from Hoot Gibson, Shannon Lucid and Norman Thagard to name a few. Those opportunities lost by other "moments in time" are the *Challenger* four (Ron McNair, Ellison Onizuka, Judy Resnik and Dick Scobee), plus Dale Gardner, Dave Griggs, and Dave Walker[2].

[2] The TFNG Oral History interviews (number of sessions in brackets) to date (2019) are: Bluford 2004 (1); Brandenstein 1999 (1); Coats 2008–2015 (6); Covey 2006–2007 (4); Creighton 2004 (1); Fabian 2006 (1); Fisher A. 2009–2011 (3); Gibson R. 2013–2016 (2); Gregory 2004–2006 (3); Hart 2003 (1); Hauck 2003–2004 (2); Hawley 2002–2003 (3); Hoffman 2009–2010 (3) Lucid 1998 (1); McBride 2012 (1); Mullane 2003 (1); Nagel 2002 (1); Nelson G. 2004 (1); Ride 2002 (2); Seddon 2010–2011 (4); Shaw 2002 (1) Shriver 2002–2008 (3); Sullivan 2007–2009 (4); Thagard 1998 (2); van Hoften 2007 (1); Williams 2002 (1).

Within these official Oral Histories, each individual was asked about their youth, early careers, the numerous assignments and space flights during their years at NASA, and the move into management or appointments outside of the space agency. To include a personality feature, each participant was also asked about their most challenging milestone, their most significant accomplishments, and what had given them the most pride during their career at NASA. In this summary, we have extracted a selection of those replies to present their thoughts on their personal achievements and successes at NASA.

Brewster Shaw recognized that future generations will be the judge of the Shuttle Program. "Well, this is a history. I mean, we're talking about history here. We don't know what history is going to say about this program. We know what history said about Apollo: it was a great success. And then history quickly forgot about Apollo. Instead of flying several rockets we had lined up to go to the Moon, we just parked them out here. So, history is fickle and it's certainly subject to politics and the winds of the nation. So the history of the Space Shuttle Program and human space flight, as we know it now, has yet to be written, but I hope that the historians are reasonable and are kind, because I think that the Space Shuttle is a wonderful accomplishment and so is the Space Station. If we don't continue to do things like this, our whole lives will end up being virtual and not real from the aspect of human knowledge, and human exploration, and humans understanding our world and our lives, and that would be a great travesty if we virtualize our future rather than living it." Though he did not mention the TFNG as a group, their place in that history will also be judged. **[6]**

Mike Coats was asked about his perspective from his two very different experiences, as a NASA astronaut and later as a field center (JSC) manager. "I've told people for years, and I don't think anybody believes me, but it's actually tougher to watch a launch than it is to ride through a launch, and it comes down to the 'control freak' part of it. When you're in the Orbiter and you've been trained up to peak efficiency, you're very confident you can handle anything that can humanly be handled. The things that can't be handled, why are you worried about it? You're anxious not to embarrass yourself when you're in the Orbiter and make a mistake. On the other hand, you have complete confidence in your crew and in the ground controllers and yourself, and 'let's go do it'. You're just so mission focused, getting it done. You're proud of the level of proficiency the crew has achieved in the simulators, getting ready to go. It's almost like, 'Okay, throw it at me, I can handle it'. Which is what you want them to be thinking.

"When you're watching a launch as Center Director, you have no control; you have nothing you can do except hope everything goes okay. That's a horrible feeling, to have no control, and because you've been through the training, you know all the different emergencies that could happen to you. You can't help but be thinking about, 'Okay, if we lose an engine now, what happens? If we lose an engine

now, what do we do? If we lose an engine now? If we lose the hydraulic system, what happens? If we lock up an engine?' That stuff goes through your mind, and you can't help it. You lived it, trained it, for years and years. So, it's tougher to watch a launch than it is to ride through it, or at least it was for me. On the other hand, boy, you're as happy as the crew when they come back safely. When you're hugging the crew out there, boy, you really mean it, 'It's so good to have you back'. That's the big difference to me. You feel responsible for the crew. The Center Director has final approval on crew assignments, and you just feel responsible for every crew when they're up there; you want them to come back safely. That's a big responsibility." **[7]**

In a subsequent interview, *Coats* expressed satisfaction in having "the opportunity to work with a lot of really good people, and I got to see what dedicated and talented people can do in some real crisis moments. We had some problems with the Shuttle and then the Station that any space program is going to have, and watching the teams work together to solve the problems and come up with some truly elegant technical solutions was really fun and really satisfying. I wish my kids and grandkids could have that kind of satisfaction. Being part of a very successful team, a motivated team, was pretty neat, a good memory. I think it was a privilege to be an astronaut and fly into space. It was even more of a privilege to be the Director of the Johnson Space Center and feel like you're part of a team, and to be able to, from that perspective, see the different parts of the team and how they work together, what they accomplished. I think being the Center Director is a unique perspective because you get to see so much. I just can't say enough about how motivated this team is. They think they're making a difference, and they are, and that's pretty neat." **[8]**

Guion Bluford is most proud of having the opportunity to become an astronaut and going on to participate in four very successful Shuttle flights. The years at NASA were "a great experience which I will always cherish. I also felt very privileged to have been a role model for many youngsters, including African-American kids, who aspired to be scientists, engineers and astronauts in this country." **[9]**

Dan Brandenstein felt that one of the "neat things about being an astronaut" was the opportunity to work with such a great team. Of course, he admitted that "Flying in space is neat, but it [the satisfaction] kind of goes back to that diverse thing. You get to know and work with the people building the vehicle; you get to work with the various people that develop the experiments and the payloads; and the flight controllers; many of the guys that process it down at the Cape; and just being able to come in contact with so many dedicated people, it's, in my mind, the best part of being at NASA."

The most memorable time for Brandenstein was the STS-49 mission (maiden flight of *Endeavour* and Intelsat re-boost), "because we had a real [challenging] time. That obviously makes it very rewarding, because you've had a problem with

something, you sorted through it, and successfully accomplished what you'd originally set out to do, even though you did it differently. But, once again, that was not just the crew or just myself, that was the whole team kicked in on that. That was, I'm sure, the most challenging, and makes it probably the most rewarding, too." **[10]**

Dick Covey was sure of the most challenging milestone in his years at NASA "Well, in my mind there's no doubt that preparing for STS-61 [the first Hubble Service Mission] was the most challenging thing because of the complexity of what we wanted to do and gaining a constituency that believed that the crew could go and do all those things that had never been done before. You know, expanding from three spacewalks max [maximum] on a mission, where two was nominal and three was exceptional, and going to five; the number of complex operations that we had. It wasn't that there was resistance. It's just that we were pushing the bounds, and so the way you have to demonstrate, prove, that you're ready to go do that, not just the crew but the agency, was, I thought, a major accomplishment.

"Overcoming challenge sometimes is the most significant accomplishment. There's no doubt that having commanded STS-61 and what we did on that mission was the greatest accomplishment that I was able to make to the agency and our nation. No question about it." And one of the proudest moments in his career? "Oh yes, [it] still is. It's way up there. Other than babies and grandbabies, getting married and things like that." When it was pointed out he rated becoming an astronaut as pretty good but felt that getting married and having children was a little higher, he replied "Yes, you've got to balance those things. If you put them all together, you're going to default over to the family stuff, there's no question about it." **[11]**

John Creighton thought that the most exciting event was the day in early 1978 when he received the telephone call informing him that he had successfully made the cut and was one of America's latest astronauts … "And then launch morning on my first space flight. They're all exciting, every launch is exciting, but I think your first one is the most exciting. Sitting out there waiting, and somebody saying, 'Ten, nine, eight, seven...'" **[12]**

John Fabian said that being part of such a remarkable group of individuals was a high point of his time as an astronaut: "When you come into a group like that, a group that is so highly selective, you don't come into it with a lack of appreciation of your own talents and abilities, and you don't come into it with a lot of self-doubt about what it is that you can do or might be capable of doing. But those thoughts are challenged. They're challenged by the very nature of the people that you're now involved with. And somehow, through the process of working with these people and working within the system and so forth, you need to come to an appreciation that your original thoughts are probably right; you do have capabilities, and you do have things to contribute, and so forth. But that's not an easy decision to make when you see the greatness of the people that are around you.

I think that that adjustment hits everybody who comes into the Astronaut Corps, because no one who comes into the Astronaut Corps has ever been a slacker."

As for his most significant accomplishment in the Astronaut Office, Fabian immediately picked out his work with the Shuttle Remote Manipulator System (RMS) "We really had an opportunity with the RMS to work on the human interface, to make it something which is straightforward and easy to use, intuitive in its application. That's now followed over into the Space Station, and potentially it will go on to other applications. I think it's the most significant thing that I did in my time, and I think it's the thing I'm proudest of." **[13]**

Terry Hart, the first of the group to leave the Astronaut Office shortly after flying on STS-41C in 1984, felt that the whole process of being an astronaut was challenging, "but there's nothing that is insurmountable, because you know you have so much help. It's not like you're ever worried about failing or whatever, because there's so much support behind you. So you just need to learn how to take advantage of all that support. So I guess, in a sense, that's the challenge, to fully integrate yourself with the team at NASA to ensure that you're all doing what's necessary for the mission. You're all focused on the right thing, and when things go wrong, you can fall back on that and find ways to work around the problems."

When asked about his most significant accomplishment at NASA, Hart replied that it was his work during STS-41C. "I guess the most visible thing was the Solar Max capture, and getting the satellite onboard. I'm sure George Abbey felt that I earned my keep in that ten seconds that I reached over and grabbed the satellite. But I'd like to think more that I helped a lot with that sense of building the team. Within my class, I felt good about my relationships with all the other guys in my class, and the gals. We all worked together well. So I always kind of looked upon myself as being a bit of an instigator of teamwork and someone that helped promote those kinds of things, which, you know, [is] a very natural thing at NASA." **[14]**

Rick Hauck considered his most challenging milestone to be preparing for STS-61F, the Shuttle-Centaur mission, which he referred to as "the mission that never was" because it was clearly going to be a very risky flight. In contrast, he thought that his most significant accomplishment during his time at NASA was that "I didn't screw up. I don't know, I just worked very hard and I was very fortunate. I was rewarded by always being given good assignments and working with a good team that answered the mail, I think. I don't know, I think my strength is probably in flying ability, but also perhaps in a leadership role in bringing people together and working through issues, but I can't point to anything in particular." **[15]**

Steve Hawley found it difficult to single one thing out when asked to highlight the most challenging aspect of his career, both personally and professionally, back in 2003. "Well … it wasn't as big a leap to go from being a scientist to being an operator as perhaps it was to go from being an operator to being a manager, and having to learn how to be successful in the world of people that do business-type

things for a living. At least, I hope I was successful. That was pretty challenging. I've had a few people say, in particular recently now that I've moved on from FCOD [Flight Control Operations Directorate], that I was one of the few people they dealt with that had any business sense. Part of that, frankly, I think, is we have a little bit of a history of people in those jobs who are there for a short period of time and then rotate back into flight assignment. I was maybe one of the first to come out of the Astronaut Office that actually did it for a prolonged period of time, where I was able to actually develop some experience in how to do business with the world of resources and procurement and all of that. Maybe if I was able to develop something of a reputation as being pretty good at that part of the business where I really had no training at all going into it, then that may have been among the most challenging things to do."

In response to a question about his most significant accomplishment at NASA, Hawley admitted "Well, that's another hard one. There's so little that you really get to do yourself. Everything you do is as part of a team, I think. I mean, obviously, the things we did with Hubble are things that I'll remember forever, but they're not things that I did uniquely. I did them as part of a team. And if it hadn't been me, it would have been somebody else that would have done it just as well. I guess every once in a while I had a good idea that somebody incorporated. I suppose, in general, particularly as I got into management jobs, the thing that gave me satisfaction on a day-to-day basis was 'did I do something today for somebody that actually helped them?' My experience, which I guess is not unique, is you go do battle on a hundred different fronts, and you're going to lose 95 of them, but you may win a few. And you have to be satisfied, I've always thought, with the knowledge that you're not going to win all of them, you may not even win most of them, but you may win some. And the ones you win are going to help somebody do the right thing, or they're going to help the program do the right thing. If you can take satisfaction in the few that you win, knowing that you really did some good for somebody or some program, then I think you do get job satisfaction in that. So, sitting here right now, I'm not sure I could tell you what any of those are, but I do feel like I won a few over the years that probably gave me a lot of satisfaction at the time; that we were able to win this point, or successfully fight for funding in some area that we thought was important, where they had cut our budget, or win some technical point that was going to make the program better." **[16]**

Mike Mullane clearly appreciated his time at NASA: "I feel very blessed that I got to fly in space," and, he added, working with "I would have to say, one of the best teams that I'd ever been with in my life, the best in MCC [Mission Control Center], the best in the crews and the LCC [Launch Control Center]. No question about it, they were the best, and I felt privileged to be involved with it." **[17]**

Steve Nagel recalled that taking on the running of the Astronaut Office, as the Acting Chief, was one of the hardest things during his time at NASA. "That was a

hard job, rewarding but difficult. Certainly the time after *Challenger* was a real hard time, but after we got our mourning process behind us and started looking forward, it was my best time there. It was real challenging, fast moving … Training for the Shuttle flights is kind of easy compared to the other stuff. You're kind of spoon-fed a syllabus. You're going back to being a student again. I don't mean to make it sound like it's trivial, easy. There's a lot to learn. You're really drinking out of a fire hose, but your life is pretty structured there. So that's not so difficult. Where I am now [2002, in the Aircraft Operations Division] is a slower, a little less demanding pace of life than being in the Astronaut Office, even though I travel a lot. I'm on the go a lot. But it's kind of a nice change of pace out there. So I guess the hardest, most challenging time was Chief of the Astronaut Office, and secondly was the *Challenger* thing. It's all been great, though. I wouldn't trade any of it. There's been the good times and the bad times, but it was a great opportunity to be there. I always felt very fortunate to have been where I was."

As for his most significant accomplishment while at NASA, Nagel thought that his work on the crew escape system was perhaps more important than flying on the Shuttle. "The flights were great," he acknowledged, "but in a way, I got more personal satisfaction out of having worked on something that I think did some good like that [the crew escape system] than even the flights. Not that I want to trade the flights, because that's why I came here, but that was the high point for me. I've talked to a lot of these people that worked on this project, that crew escape project, not just in NASA … even Bill Chandler, the manager, the chief Navy jumper, that did the jump on the pole. They said this was the high point of their career. It was the best thing they ever did … because it was so important to everybody. I mean, the Shuttle's grounded, and we're doing something that's going to get it flying again. I think everybody, almost no matter what they worked on through that time period, had a similar feeling. Really, it must have been kind of like people felt going to the Moon, a little bit. I don't want to compare it exactly, but that kind of a feeling.

"I had that overall feeling working on the Shuttle Program, anyway, or in Station Program, no matter what capacity, even in what I'm doing now. You feel like you're a part of something that's bigger than you, that's worth doing, which is really great. Not everybody gets that opportunity to work on something like we do here. But I really had that feeling on the crew escape project for that year or two." **[18]**

George 'Pinky' Nelson came up with a different perspective. "Getting selected was certainly the most challenging thing," he felt. He then continued, "I think the job of being an astronaut is not all that hard. You're in an incredible support system. You're extremely well trained and provided with resources that you need to get trained, so if you're a motivated person who has basic, good motor control and [is] fairly smart, you can learn how to do all the procedures. It's a little different for the pilots, I think, who have to have special skills and who are just really terrific at

flying the machine. I can't think of anything I had to do that was really hard. I found it all just very enjoyable. It took a lot of effort to learn how to work in the spacesuit really well, but it was an interesting challenge and fun. The rest of it just came naturally. Being a person with a fairly short attention span – working within the system of going to endless meetings, working within the NASA system, which is really the one that Chris [Christopher C.] Kraft [Jr.], Al [Alan B.] Shepard, Deke [Donald K.] Slayton, and those guys made up on how to run a space program, [and which] really functions well in terms of checks and balances and procedures – learning to work in that system has its challenges, because you have to really carefully document and account for everything you do. So just working in that system was a bit of a challenge for somebody like me." As for his biggest accomplishment while working at NASA, Nelson rated the support of his family for what he was doing the highest. "I would rank the family support plan as one. I think that's had a big impact on the quality of life of the astronaut program. Then just technically, I think the work that I did on the spacesuit made it a useful tool." **[19]**

Rhea Seddon thought that her greatest accomplishment while at NASA was to ensure she also had a normal life. "When I went into NASA, I thought, 'If I choose this important and fascinating career, am I ruining all of my chances for ever getting married? If I'm an astronaut and I decided to have a baby without being married, what would be the consequences of that? Is there something that's going to happen to me that will make it difficult for me to have kids? Will I ever meet somebody whose life will mesh with this insane life I'm about to undertake?' So it was one of those unknowns, and one of the things that I hoped to accomplish at NASA was to come out on the other end with what I considered to be a normal life, the kind of life that I wanted to have. I was able to do that. I don't know if it was fate or the Good Lord looking out for me, or the right person coming along, or a combination of all those, but I'm happy that I didn't have to give up those other parts of life in order to do my work at NASA. Was I the world's best astronaut? Probably not. Was I the world's best wife and mother? Probably not. But I got to do all of those things, and that was very important to me. I wanted to look back when I got to the age where I am now and say, 'I was able to do all of those things'. When they were handing out flight assignments and Hoot and I had just gotten married, there was the decision of whether to wait to have children or to go ahead and try. I considered [that] when I'm 60 and I look back, would I rather have an early flight and no children, or children and maybe no flights, or maybe later flights? The children were a higher priority. So I was glad to be able to look back when I turned 60 and say, 'It all worked out. It worked out just fine'. I think some other people had to choose one or the other, and I was lucky that I didn't."

As for the most challenging aspect of working at NASA, Seddon selected "probably some of the physical aspects of training and doing the work. The scuba training was hard for me. It was physically hard for me. I doubted whether I was

going to be able to do it. The suit work that we had to do, there were times when I thought, 'I'm not sure that I'm going to be able to do this, and if I'm even able to do it, would I be able to do it in an emergency and do it well and quickly?' So I think the most difficult part for me was the challenge of being small, because NASA – even though they broadened the height requirements so that they could take more women, and bless them for that – I don't think they had really planned or thought about what it would be like for a really small person to do the things that larger men found pretty easy. There were things along the way that I had to accommodate to. Getting into the T-38 was always a struggle. Certainly there were the physical aspects of being pregnant and wanting to continue to work when I'd rather be home with my feet up. I was just determined to work through my pregnancies and come back healthy and ready to go again, and to have good care for my children. So that was part of it, just the strength-type things. I wish I could say something more wonderful about challenges that I overcame. You know, people say, 'Wasn't it difficult to fit into an all-men's world?' I just ignored that part of it. If they didn't want me there, that was their tough luck. And so what, if I didn't fit the mold. I wasn't a test pilot. I didn't get much credit for what I did on my flights. Everybody else got a lot of glorification for doing spacewalks and rendezvous and being commanders of things, and life sciences got kind of short shrift. I didn't care. That didn't bother me. I was there to do what I wanted to do and what needed doing. Nobody else wanted life sciences flights, but that's what I wanted. I felt like I had accomplished good things in being on those flights." **[20]**

James 'Ox' van Hoften, when asked about his most significant accomplishment in the years he spent in the Astronaut Office, replied "Oh, I think the EVA side of this thing [on STS-41C and STS-51I]. Obviously, I was just in the right place at the right time. I was really lucky, and anybody could have done the same thing. Nothing that I did was, I think, something that somebody else couldn't have done. I would never try to convince myself of that. But I think doing those things and making it work. That second mission was tricky. That did take a lot of strength and a lot of work at that. But the one thing I've been famous for is I'm very calm under pressure, and I don't rattle very easy. On something like that, it worked. It was nice to be able to do that. I look back on it; it was a pretty short time. I was only there eight years, and it seems awful short, but it seemed like just the perfect time for me, and it was … the experience was extraordinary. I came away with nothing but positives on that. There's a lot of people I know that stayed there for a long time and came away with some pretty mixed stories. I don't have any of those. There's a few bad ones that I don't tell anybody, but nothing that was not real positive for me."

Like many of his colleagues, van Hoften felt that his toughest challenge was getting selected for the astronaut program in the first place, and then "once you're there, trying to maintain the right attitude. I mean … the attitude you have when everyone is getting assigned to a mission and you're not is tough. That's a really

tough one, and to keep going forward and doing like you're supposed to do and just wondering, 'What the heck do I do? How do I get on the ladder here?' Looking back – it seemed like forever at the time – it was just a matter of months, and once you're there, it was just wonderful. Once you were finally in the loop, it was brilliant. There were some other guys who were really good. I can't even remember who flew last, but there were a lot of guys like Covey, for instance, that didn't fly until late in the program, and he's one of my best friends, and I couldn't understand why he was not getting selected for something. He had kind of a bad run at it in the beginning, but there was a lot of them. There's a lot of stories about the Air Force getting [overlooked], you know – [George] Abbey always supposedly had favor for the Navy, and who knows? But once guys all got in the circle there, it worked great, and once everybody started flying, people stayed friends … [But] There was an awful lot of competition, although not openly; you know, there was a lot of competition to just get attention, I guess. That's hard. A lot of us aren't real good at that. You don't want to go out and kiss up to people, and some people tried, and that wouldn't work. So no one knew what the heck to do." **[21]**

Don Williams firmly believed that becoming a mission commander was by far his greatest accomplishment at NASA. "The responsibility that weighs somewhat heavily upon you and the accountability that's always there, always there sitting on your shoulder like, 'Okay, Don. This is your chance. Go do it'. That was a challenging thing to do. The second most one, from a crewmember and a pilot perspective, is learning enough about a very complex vehicle that you can fly and operate it in all of its environments from the launch pad to the landing, [and] post-landing activities. I'll give you an example. I flew A-7 [Es], the Corsair [II] airplane, a light attack airplane, off of the [carrier USS] *Enterprise* in all kinds of weather, at night and [in a] wartime environment. That airplane had inertial systems, radars, weapons systems, environmental control systems, hydraulics, electrical, heads-up displays, electronic warfare systems, and communications. It was a fairly complex airplane, and flying that by yourself at night, off a carrier, on a scale of one to ten is about a seven or eight, roughly, in complexity.

"The Shuttle on that same scale is about a 30. It's two orders of magnitude more complex. It's amazing. It's largely due to the environment it flies in, from a rocket launch to an orbiting spacecraft, to a hypersonic re-entry, to a conventional gliding kind of airplane. The systems onboard to make that all operate are very complex and they all interact with each other and they have a lot of redundancy by design. But the redundancy also adds complexities, because you have to know how to gracefully fault-tolerant them down as you have failures, which you have lots and lots of in simulators and hopefully not too many in orbit. So it's a very complex flying machine and it requires a lot of attention to detail by everybody; not just the crew, by everybody.

"The mission commander challenges, for me personally. [were] being able to … I don't know whether you ever master something as complex as a Shuttle, but you get pretty familiar with it to a point where the 800 or so switches and controls

onboard there, you know what every one of them does. And when you pull one, push one, turn one, or toggle it, or whatever you do to it, you have some idea of what happens inside the spacecraft, whether it's under your foot, next to your arm, or 70 feet away in the back."

Asked if he had any other comments for his Oral History, Williams replied "Maybe two, the first one being the teamwork that it takes to pull this off. I think you may have heard a lot of other people say this, but in order to successfully pull off a Shuttle mission, or any human space flight mission, [it] takes thousands and thousands of people all doing their job correctly every single time. You cannot afford [for] anybody to fail and [still] have a successful mission. And I think every crewmember that you ever talk to will probably say that, if you ask them about the teamwork that's required. A lot of credit goes to the 'invisible people', as they call them.

"The training teams, the flight control teams, the planning teams, the contractors, and civil servants that make all this happen. The secretaries, the people that take out the trash, the people that glue the tiles on the Orbiter, the people that do the launch countdown, the people that paint the towers, and the people that make the hardware and the software that make it all work. Every single one of those people has to do their job, and there's thousands of them, and it all has to come together in the end. Those of us who get on the pointy end of the spear, if you will, maybe get a lot more credit than we deserve. You have to have trust. You have to trust them, and that's a special thing about being part of this human space flight program. It's a very special thing and it's very unique about this program and perhaps aviation in general, particularly high-performance carrier aviation, where you depend on the people that work on the airplane, that work on the catapults, that work on the arresting gear, that drive the ship, that fuel the airplane, that load the airplane, that fix everything that goes wrong and get it ready to go, so you can go fly it and do your job. That's part of the team. So, being part of a huge team like that is a really fascinating and wonderful thing. I mean, that's an enjoyable thing to do.

"Then, finally, the perspective you get from on orbit of this planet of ours, which has been described in much better words than I can put it, but you say to yourself, 'Hey, it really is round', which is good, because otherwise all this orbital mechanics and stuff wouldn't work. The perspective you get, that there are no boundaries between nations and there's no labels on anything. The only visible boundaries, quite truly, that I recall seeing as I go back and look at the video and the pictures, is between the land and the sea. Therefore, why is it that we fight over things so much and we disagree and we argue about lines that are drawn on the surface by humans, which seems to cause people to disagree about things, when, in fact, we're all in this together? I'm not necessarily an advocate of world peace and world unity, but on the other hand, getting along with each other seems like the right thing to do, because we don't have any place else to go right now. Maybe someday we will." **[22]**

SUMMARY

Over four decades after their selection, and 20 years after the final member orbited the Earth, many of the surviving members of the Class of 1978 participated in the NASA JSC Oral History Program, reflecting on their very personal contributions and achievements to the nation's space program as it matured from Apollo into the Space Shuttle and on through the creation of the ISS to the emergence of the next generation of American human spacecraft. The new vehicles are the successors to the Shuttle program that the TFNG were chosen for and flew on, one which was greatly enhanced by their dedication, skills and contributions. Exactly how their efforts will be recorded in history will be for future generations, as Brewster Shaw indicated, and after all, it is all "a matter of time." But what is their legacy in the program today, with a new generation of space explorers hoping to embark in the next era of human space flight, returning us to the Moon and venturing out deeper into space? That is explored in the final chapter in this story of the TFNG.

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