10

The TFNG take wings

"We are go for main engine start…
we have main engine start…
and ignition… and liftoff… liftoff of STS-7
and America's first woman astronaut…
and the Shuttle has cleared the tower."
STS-7 Air-to-Ground Transcript
June 18, 1983.

The most productive era for the Thirty-Five New Guys (TFNG) as a group, in terms of missions flown, was from the middle of June 1983 through to the beginning of January 1986. In this period, all 35 members of the Class of 1978 flew in space for the first time, with some able to complete a second mission. Following the four Orbital Test Flights (OFT) and two 'operational' missions, NASA flew a total of 18 successful missions during that period, all but one of which (STS-51F in July 1985) included at least one of the Class of 1978 among the flight crew. This phase of their story began over a decade after the authorization to develop the Space Shuttle program and five years after their selection to train to fly on that vehicle. The formal Shuttle testing phase was complete and two operational Orbiters (*Columbia* and *Challenger*) were available, with a third (*Discovery*) soon to be delivered. As the first members from the Class of 1978 finally seized the opportunity to become 'real' astronauts and fly into orbit, the whole group now had the chance to make their mark on space history, exploring and expanding the new possibilities that the Space Shuttle offered.

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ASTRONAUTS AT LAST

It had taken five years of training and preparation, interspersed with delays in developing and qualifying the hardware, but finally on June 18, 1983, the first four representatives of the TFNG left the pad and headed for orbit, immediately making history as the world's first five-person crew to fly. Under the command of former STS-1 Pilot (PLT) Robert Crippen on his second mission, the other four astronauts represented the transition to the ethos of the 1978 selection, though this was not emphasized. Veteran Commander (CDR) Crippen and PLT Rick Hauck, a Vietnam veteran and the first of the new generation of pilot astronauts to fly, had old-school NASA backgrounds, having both been seconded from the U.S. Navy (USN). Joining them were the three Mission Specialists (MS), who represented a cross-section of experience in both civilian and military achievements. Sally Ride, who held a PhD in physics and had acquired teaching experience, became the much anticipated and publicized first American female to reach space. She was joined by United States Air Force (USAF) pilot John Fabian, another Vietnam combat veteran who had also found time to earn a PhD in Aeronautics and Astronautics, and experience in academia at the USAF Academy. The third MS was Dr. Norman Thagard, an electrical engineer, pilot and the third crewmember who was a Vietnam combat veteran – with the United States Marine Corps (USMC) – who more recently had studied for a Medical Doctorate (MD). Thagard had been assigned to the flight just six months earlier with the specific remit to study the effects of Space Adaptation Syndrome (SAS) on himself and his crewmates. So, on that first flight of the TFNG, there was a mix of veterans in space flight, combat and flying, together with talented scientists, engineers, a doctor and an academic. This was precisely what NASA had been searching for when it announced in 1976 that its astronaut selection process would be broadened, and chose its first astronauts specifically to crew the Space Shuttle.

Ride Sally Ride

In her 2002 NASA Oral History, Sally Ride was asked about the pre-flight media attention on her and the flight, and whether that attention had impacted the whole crew or their training: "Actually it didn't. NASA did a very good job protecting me and protecting the rest of the crew. I did very few interviews from the time that we entered training until our crew press conference and the interviews afterward. Then we did no more interviews until our pre-flight press conference about a month before the flight. Right after that press conference, we did a day of solid interviews. NASA protected me while we were in training, and even the day that we did all our interviews, we did them in pairs. I did most of my interviews with Rick Hauck or Bob Crippen. NASA's attitude was 'She's going to get all the attention, and we need to help her', and they did. They did a really good job shielding

me from the media so that I could train with the rest of the crew and not be singled out. We also tried to get across that space flight really is a team thing." She was then asked about her awareness of all the attention she was receiving in the newspaper articles, and all the special attention from the different organizations: "I was only vaguely aware of it. The training, particularly in the last couple of months before a flight, is very intense. It was early in the Shuttle program. Four of us on the flight had never flown in space before. We had a lot to learn and there was a lot of information coming at us. The training really accelerated and intensified during those two months before the flight. I was spending virtually all my time trying to learn things; what I'd learned, practice, and just stuff that one last fact into my brain. I was barely watching the news at night and really wasn't aware of all the attention. Of course, I was a little bit aware of it – I couldn't help but be – but it wasn't impacting my training at all." **[1]**

At the Kennedy Space Center (KSC), an estimated crowd of 500,000 people witnessed the launch of the first American woman into orbit, including an estimated 1,628 journalists, the fourth largest press turnout in KSC history **[2]**. Advised to "have a ball" in the last message relayed to the crew cabin prior to lift off, Sally Ride's enthusiasm in making it to orbit was evident in her explanation of ascent as "definitely a [Disney] premier E ticket."

STS-7 (June 18 – 24, 1983)
Flight Crew: Robert L. Crippen (CDR), Frederick H. HAUCK (PLT), John M. FABIAN (MS-1), Sally K. RIDE (MS-2), Norman E. THAGARD (MS-3)
Spacecraft: Challenger (OV-099) 2nd mission
Objective: 7th Shuttle mission; commercial satellite deployment; SAS medical investigations
Duration: 6 days 2 hours 23 minutes 59 seconds
Support Assignments: Capcom teams for STS-7 were identified in an Astronaut Office memo dated April 22, 1983 and confirmed in a NASA News Release a few weeks later. **[3]** This also reflected the constantly evolving developments in the Astronaut Office, as members of the TFNG were being supplanted in the majority of the support team roles by Group 9 astronauts. For STS-7, only two members of the 1978 group were assigned to Capcom duties. Prime Capcom on the Orbit 1 'Ivory' team was Jon McBRIDE, backed up by Terry HART. The latter was also assigned to Team 4 duties (an offline, on-call, troubleshooting team)[1].

[1] For these mission summaries, members of the TFNG are identified by their surname in CAPITALS. The authors were unable to find details of other astronaut support assignments for STS-6, 7 and 9 during their research, and would welcome any information from readers regarding such assignments to complete their records.

During their mission, the STS-7 astronauts deployed satellites for Canada (ANIK-C2) and Indonesia (Palapa B-1) and operated the Canadian-built Remote Manipulator System (RMS) to perform the first deployment and retrieval exercise with the Shuttle Pallet Satellite (SPAS-01). Along with Crippen, Hauck conducted the first close proximity piloting of the Orbiter, alongside the SPAS-01 free-flying satellite. Though he was a late addition to the crew, and with no formal planning to do so, Thagard completed one of the SPAS retrievals using the RMS, but for most of the mission he was occupied with conducting various medical tests, collecting data on the physiological changes associated with the body's adaptation to space.

In 2006, John Fabian recalled this division of work between the MS: "We trained as a crew of four, and then relatively late in the program, Norm came on, and we tried really hard to integrate Norm into the rest of the crew activities. Sally, for example, was lead on our electrophoresis experiment, doing some fluid work, trying to get some very pure substances out of this process. And I was the lead on doing the deployment and the retrieval using the Remote Manipulator System. But Sally was going to do essentially as much of that as I was. But remember, Norm Thagard [had worked] on the RMS, so he was no stranger to this system. So we worked hard to try to find a way to work Norm into that, and we ended up having him do one of the retrievals without it being written in the checklist that way." **[4]**

Fig. 10.1: (left) A new generation of astronaut role models: Sally Ride, MS on STS-7 and America's first woman in space; and Guion Bluford, MS on STS-8 and the first African-American to fly in space. (right) Norm Thagard conducting important SAS studies during the STS-7 mission.

Taking your turn in the barrel

Fabian also recalled the post-flight Public Relations (PR) tour after the missions: "Rick and I went to Indonesia [a PR tour following the deployment of the Palapa satellite during the mission], and had a grand time. We went to a meeting of the congress or parliament or whatever it's called in Indonesia; went to the president's house and visited with the president; talked to a lot of school kids, here and there; went to their equivalent of the Fourth of July, a national independence holiday. Had a really nice time, treated very nicely. I got to go back to my hometown and was treated like a hero, got the key to the city for what it's worth. We went to New York City and went to the major's house, Mayor [Edward I.] Koch, and met Floyd Patterson, the famous boxer. It was fun. It really was fun. We all laugh about it, you know, 'It's your turn in the barrel', and everybody has to go through this post-flight, but it's one of the things that you do in return for the reward of flying in space. But it was really fun. I didn't do very many things that I thought were distasteful. There were a few, frankly, and you can get that – if you're not careful – you can get to feeling that you're being utilized. In other ways, it was something like being wallpaper.

"When we went to Washington we went to the state dinner, and that was very nice. There was a lot of media attention to the fact that Sally was there, and Norm Thagard was knocked into the wall by a photographer, in trying to get to Sally. And they're not courteous people. I mean, there's something of the vulture that's going on there [going after the story] because Sally is here. Sally was married at the time to Steve Hawley, and we went someplace, and Steve was with us. And we went through the door, and someone [said] 'Stop. You can't come here. This is for the astronauts'. And Steve says, 'We *are* the astronauts'. Really funny."

Becoming America's First Woman in Space

After the mission, attention naturally focused on Sally Ride, who recalled her experiences in her 2002 Oral History. "I remember being disappointed that we weren't going to land in Florida, but I grew up in California, and we'd spent a lot of time at Edwards Air Force Base [AFB]. The pilots had done a lot of approach-and-landing practice at Edwards, so it almost felt like a second home. But there weren't many people there waiting for us!" There were still crew activities to perform and a significant amount of PR for Ride, because 20 years after Valentina Tereshkova became the first female to enter orbit, Ride would forever be known as the first *American* female to fly in space. "I think that's when all the attention really hit me. While I was in training, I had been protected from it all. I had the world's best excuse: 'I've got to train, because I have this job to do'. NASA was very, very supportive of that. So my training wasn't affected at all. But the moment we landed, that protective shield was gone. I came face-to-face with a flurry of media activity. There was a lot more attention on us than there was on previous crews, probably even more than the STS-1 crew."

She received some assistance from NASA for this increase in activities and attention after her flight: "[I had] a lot of help with fielding the requests. All the requests went through NASA, through the Public Affairs Office [PAO] and through the Astronaut Office, but very little help in preparing to talk with either the press or to make public appearances. Now, of course, all astronauts learn 'on the job' how to give a talk and how to work with the public and with various organizations.

"I'd done my share of public appearances and speeches before I'd gone into training, so I knew how to talk to the press and I knew how to go and show my slides and give a good speech. But just the sheer volume of it was something that was completely different for me, and people reacted much differently to me after my flight than they did before my flight. Everybody wanted a piece of me after the flight." Occasionally, there were times when she felt that some of the events she attended or some of the questions were not necessarily NASA-related, but not too much. "Most often, people were just interested in the flight, in my experience, in my view of the historical nature of the flight, that sort of thing. Not too much on my personal life. That really wasn't as much of a problem for me as the sheer volume of things that I had to do. It was just incessant for months." Fortunately, not long after she returned on STS-7, Ride learned that she would be flying again, and thought "Thank goodness. Back into training, safe again." **[1]**

STS-8 (August 30 – September 5, 1983)
Flight Crew: Richard H. Truly (CDR), Daniel C. BRANDENSTEIN (PLT), Dale A. GARDNER (MS-1), Guion S. BLUFORD (MS-2), William E. Thornton (MS-3)
Spacecraft: Challenger (OV-099) 3rd mission
Objective: 8th Shuttle mission; satellite deployment; RMS load evaluation tests; continued SAS medical investigations
Duration: 6 days 1 hour 8 minutes 43 seconds
Support Assignments: The support assignments for this mission fulfilled by the TFNG were identified in an Astronaut Office memo dated July 20, 1983. Mission Control Center (MCC) Support Astronaut Office Representative was Loren SHRIVER; Family escorts were Steve NAGEL, Rick HAUCK and Jim BUCHLI; Jeff HOFFMAN was listed as Capcom. However, when a news release was issued on August 23, HOFFMAN was not assigned to Capcom duties. **[5]** This demonstrates the difficulty in detailing support assignments and the often-unreported changes to the original lists with regard to who actually fulfilled an assignment real-time. Down at KSC, the Launch Support Team for STS-8 included Dave WALKER as Weather Pilot (WX), Shannon LUCID as Astronaut Support Person (ASP), and John CREIGHTON.

Both the launch and landing of this flight took place at night, recording more firsts for the Space Shuttle program and the TFNG. It was later revealed that NASA had dodged a bullet on this flight, having come perilously close to recording the first catastrophic loss of a Space Shuttle and her crew[2].

After the removal of the second Tracking and Data Relay Satellite (TDRS), the rather empty payload bay of *Challenger* was partially filled by the dumbbell-shaped Payload Flight Test Article (PFTA), brought forward from the STS-11 mission. Unberthed but not released by the RMS, the aluminum and stainless steel PFTA measured 15 x 16 ft (4.5 x 4.8 m) with a mass of 8,500 lbs. (3,855 kg). It was fitted with four RMS grapple fixtures and was used to simulate a large mass for flight testing of the robot arm. During the mission, the crew gained experience in evaluating the reaction of the RMS shoulder, elbow and wrist joints to higher loads than previously flown.

By flying on STS-8, Guion Bluford became the first African-American to fly in space though not the first black astronaut. Three years earlier, the Soviets had launched Cuban Air Force pilot Arnaldo Tamayo-Mendez aboard Soyuz 37 for a week-long visiting mission to Salyut 6. Despite this, Bluford's mission was a significant step forward for the diversity of American space flight crewing, and he was fully aware, as with Sally Ride before him, about the role model he now became to the youth of America. "Although there was a lot of interest in my participation on the mission, I focused my attention on making the mission a success and stopped doing PR events during the last six months of training," he said in 2004. Bluford went on to comment on his first experiences with microgravity, or zero-g: "Once we completed our OMS [Orbital Maneuvering System] burns, I unstrapped from my seat and started floating on the top of the cockpit. I remember saying to myself 'Oh, my goodness, zero-g', and like all the other astronauts before me I fumbled around in zero-g for quite a while before I got my space legs. However, it was a great feeling, and I knew right away that I was going to enjoy this experience." **[6].** Bluford and Gardner were both responsible for operating the Continuous Flow Electrophoresis System (CFES) package during the mission, and while Gardner helped Truly with the PFTA operations, Bluford took photos to document the event.

[2] A post-flight inspection carried out on September 27 revealed the shocking discovery of corrosion, particularly in the left-hand Solid Rocket Booster (SRB) nozzle, which breached the 1.5 inch (4 cm) limit to just 0.5 inches (1.3 cm). Had the nozzle burned through on ascent, it would have caused a side-thrusting escape of superhot gas exhaust, resulting in the total loss of control and break-up of *Challenger*. Later estimates suggested that at SRB separation a cataclysmic burn-through, similar to that on STS-51L (mission 25), would have taken place just 14 seconds later. All of this came as a complete shock to the crew.

Bluford spoke of his post-flight agenda in his 2004 Oral History. After the mission, NASA Headquarters assigned Mary Weatherspoon to work with Bluford on his PR agenda. "Mary was a public relations specialist from NASA Headquarters who had lots of experience doing PR support for the NASA Administrator," Bluford explained. "We worked together to determine which events we should do and how best to support all the speaking requests. She handled all the transportation and logistics for each PR trip and she served as my escort at many PR functions. We worked well together as a team. From October to December of 1983, we made three to four trips a month to various parts of the country. We tried not to spend a lot of time crisscrossing the country, but tried to focus on a particular area of the country on each trip. In several cases, we convinced people to change the date of their events in order to best accommodate my schedule. Between trips, I would spend a lot of time answering the mail and preparing for the next trip. On each trip, I talked about my experiences of flying on STS-8, the importance of the space program, the need for more scientists and engineers in this country, and I tried to acknowledge the role of teachers, parents, and role models in my life. I used the PR trips to thank the American people for giving me the opportunity to fly in space and tried to show my appreciation to those organizations that helped me the most in life. I particularly focused my gratitude on Penn State University, the City of Philadelphia, the United States Air Force and the Tuskegee Airman. It was a wonderful three months.

"I went back home to Philadelphia for four days in November and rode in the Thanksgiving Day Parade. I met with Mayor Wilson Goode of Philadelphia and Governor Richard Thornburgh of Pennsylvania. I visited the University of Pennsylvania's Children's Hospital and several schools in Philadelphia, including Overbrook Senior High, my alma mater. I spent time at the Franklin Institute in downtown Philadelphia talking with school kids about the importance of studying math and science and I participated in numerous press conferences. It was a busy four days. I went to Hollywood [California] and joined up with Bob Crippen to do a TV special on the 25th anniversary of NASA. Bob Hope hosted the event, as we highlighted some of the many accomplishments of the Agency. I also attended an awards program for the NAACP [National Association for the Advancement of Colored People], and received the NAACP Image Award. It was an exciting experience.

"In October, my wife and I went to Washington D.C. to attend several events. We attended a ceremony in the Pentagon, hosted by the Chief of Staff of the Air Force, General Charles A. Gabriel, who presented me my Air Force Command Pilot Astronaut Wings. John Fabian also received his Air Force Astronaut Wings at the same event. There was a small reception, after the ceremony, with quite a few flag officers. From there, the wife and I went to the Smithsonian National Air

& Space Museum to join President [Ronald] Reagan. The President gave a speech recognizing NASA on its 25th anniversary. I participated in that event with Sally Ride, several other astronauts, and with the NASA Administrator. By the end of the year, I decided to get off the PR circuit and return to my normal duties in the Astronaut Office. Although I enjoyed my experience giving speeches and signing autographs, I felt it was time for me to support some of the other astronauts who were getting ready to fly. However, I had one more surprise that occurred after the Christmas and New Year's holidays. Among the mail that I had received during the holidays there was a letter from the Undersecretary of Defense for Personnel. In the letter, he congratulated me on my accomplishments and officially notified me that I was promoted to full colonel. The Department of Defense [DOD] had decided to re-initiate an old policy of promoting astronauts when they flew in space. I was authorized to wear the new rank, as the Air Force got approval from Congress for my promotion. It was a great gift from an organization that I felt very proud of."

The 'Eyes' patch

Personal crew patches for American missions had been common since 1965 and Gemini 5. Continuing the tradition, each Shuttle crew designed their own personal emblem which became synonymous with their flight, and naturally became a collectable item in patch, decal, lapel pin and memorabilia form. The official STS-8 emblem depicted the dramatic separation of the twin Solid Rocket Boosters (SRB) as the Orbiter streaks to orbit, but there was a second patch, known as the "eyes" patch, that was not worn by the crew but was present as a cake on the table during the pre-launch meal.

In his Oral History, Bluford commented on the comic patch. "The 'joke patch' was shaped like an eight-ball with two of the Shuttle windows depicted on it. Dick Truly was depicted as half asleep looking out one of the windows while the rest of the crew was shown wide-eyed looking out of the other window. An *Aviation Week* article on our flight highlighted the 'joke, or eight ball' patch when they described our mission." Designed by pilot Dan Brandenstein, the 'unofficial' STS-8 patch was given a slightly different explanation in *JSC Roundup*: "Richard Truly [in the right hand window], steely eyed and bespectacled veteran of STS-2 and now Commander of STS-8, will lead four space rookies who are shown here [in the left window, hanging on] slightly awed by their participation." **[7]** There is, however, another explanation for the symbolism. The bespectacled eyes in the right hand window represented Dr. Bill Thornton, chasing after the blood of his four concerned colleagues in the left window, who are frantically trying to get away from participating in his space sickness tests during the mission.

Fig. 10.2: The STS-8 'Eyes' joke patch (Image courtesy of Joachim Becker, SpaceFacts.de)

A new and confusing numbering system

On September 9, 1983, NASA issued a memo outlining changes to both the schedule and the designations of future Shuttle missions. This was partly due to delays with some payloads and the potential confusion of missions flying out of numerical sequence, as well as identifying the proposed use of the Shuttle launch facility at the Space Launch Complex (SLC-6 or "Slick 6"), at the USAF Vandenberg AFB in California. As some reordering of the flights was expected, crews would now be announced by *payload assignment* rather than a specific STS number, beginning in 1984.

The designation of a mission would now consist of a numerical prefix to indicate the U.S. Fiscal Year (FY)[3] in which the launch would occur, a numeral to identify the launch site (either "1" for KSC or "2" for Vandenberg), and a letter suffix to reflect the original sequence of launch.

[3] The U.S. Financial, or Fiscal Year, which defines the U.S. federal government's budget, runs annually from October 1 through September 30.

The first seven missions already flown would not be amended retrospectively, and as the next mission (STS-8) would fly within FY 1983, it too would not be given a new designation. The next flight, manifested to carry Spacelab 1, was scheduled to be the first mission launched in FY 1984, but as it was well advanced in its processing schedule it was decided to leave it officially as STS-9, though it also became known administratively as STS-41A. The STS-9/STS-41A designation can be used as an example of the coding in NASA's new system: *STS* indicated a Space Transportation System flight; the *4* meant that the planned launch was in FY 198*4*; the *1* indicated a launch from KSC; and the *A* showed that this was the first mission assigned to FY 1984. With 26 letters of the alphabet available, this somewhat over-optimistically suggested up to 26 missions could be launched within a year, or one every two weeks, from *both* KSC and Vandenberg, giving a maximum on paper of 52 missions in 12 months! The resulting adjustments to the crews already assigned can be seen in Table 10.1

The former STS-10 mission became another designation casualty, due to the delays caused by difficulties with the Inertial Upper Stage (IUS) following its deployment from STS-6. The classified STS-10 payload was to have deployed on an IUS, which meant that a postponement was necessary to allow the problem to be resolved. As a result, the mission designated STS-10 was permanently deleted from the manifest, with the crew stood down pending reassignment to a new mission.

As logical as the new system looked on paper, in reality it was subject to change almost immediately, as the crews and assigned Orbiters changed over the months while the basic payload remained with the same designation code. This also meant that the missions frequently flew out of numerical sequence over the next three years, making it even more confusing than before. The idea was sound in trying to track a payload through the system, assign the hardware and not get bogged down in numerical identification too early, but due to the complexity of the payloads to be flown and the uncertainty that they would remain on time, or that the assigned Orbiter would be ready to fly, it simply did not work as intended. It also gave rise to the Astronaut Office lore: "Don't fall in love with your Orbiter or payload, as it will change."

It would probably have been far easier to keep the lettering system pre-flight to track the main payload, then assign the next STS-Arabic number to the mission once it had left the pad. Thus the tenth mission, STS-41B, would have become STS-10 on launch, the next one, STS-41C, would be STS-11, and so on. That way, even if the payload letter designations went awry, at least the STS launch sequence would remain intact. This method had been adopted by NASA before in unmanned programs, where the letter code assigned prior to launch was replaced by the next number in the sequence at lift-off, but it was decided this would be impractical for the Shuttle. As author Michael Cassutt explained: "After the IUS failure [in April

TABLE 10.1: STS CREW ASSIGNMENTS (1983/1984) NASA ASTRONAUTS ONLY [September 9, 1983, JSC]

Old designator	New designator	Primary payload	Planned Launch date	Commander	Pilot	Mission Specialists		
STS-9	41-A[1]	Spacelab 1	Oct. 1983	Young	SHAW	Garriott	Parker	
STS-10	-	DOD	Cancelled	Mattingly	SHRIVER	ONIZUKA	BUCHLI	
STS MISSIONS FOR CALENDAR YEAR 1984								
STS-11	41-B	Palapa; Westar	Jan. 1984	Brand	GIBSON R.	McCandless	STEWART	McNAIR
STS-13	41-C	Solar Max; LDEF	Apr. 1984	Crippen	SCOBEE	NELSON G.	VAN HOFTEN	HART
STS-12	41-D	Telesat; Syncom	Jun. 1984	Hartsfield	COATS	RESNIK	HAWLEY	MULLANE
STS-15	41-E	DOD	Jul. 1984	Crew not assigned				
STS-14	41-F		Aug. 1984	Crew not assigned				
STS-17	41-G		Aug. 1984	Crew not assigned				
STS-16	41-H		Sep. 1984	Crew not assigned				
STS-18[2]	51-A		Oct. 1984	Crew not assigned				
STS-20	51-B	Spacelab 3	Nov. 1984	Overmyer	GREGORY F.	Lind	THAGARD	Thornton W.
STS-19	51-C		Dec. 1984	Crew not assigned				

[1]The STS-9 designator remained in place but the mission was also unofficially known as STS-41A. Group 8 astronauts are shown in CAPITALS.
[2]Although STS-51A and the following two missions were planned for launch in 1984, they were the first three missions manifested after the start of U.S. Fiscal Year 1985 (October 1) and were therefore designated 51A, 51B and 51C instead of 41I, 41J and 41K.

1983], STS-10 had been postponed for at least a year and was likely to be launched after STS-14. STS-12 was slipping behind STS-13… In the program office [they] were facing a flight order that went 11, 13, 12, maybe 14, 10. Missions beyond that were in total chaos." **[8]**

The origins of this new system came from a team in the program office that required payloads to be planned in advance, in some cases as much as a year or two. But there was an ulterior motive as well, as apparently the new center director, Gerry Griffin, who had been a Flight Director involved with Apollo 13 in 1970, did not want to fly an STS-13. Thus, the original STS-13 would be redesignated and fly as STS-41C in 1984, while the thirteenth Shuttle mission launched would now be known as STS-41G.

On September 21, NASA confirmed two new crews for missions designated STS-41E and STS-41G, as well as the new assignment for the former STS-10 crew. The STS-41E mission was planned for a June 1984 launch and the second flight of the new *Discovery* Orbiter. Its payload was listed as two commercial satellites (Telesat and Syncom IV-1), the Large Format Camera, and a large experiment support structure provided by NASA's Office of Aeronautics and Space Technology (OAST). The STS-41E crew, commanded by Karol Bobko, included four more TFNG: Don Williams as PLT, following his return to the Astronaut Office after completing his temporary management role; and MS Rhea Seddon (MS-1), Dave Griggs (MS-2), and Jeff Hoffman (MS-3). Griggs had been selected in 1978 as a pilot astronaut but was taking the role of MS-2/Flight Engineer (FE) for this mission, giving him the chance to gain experience prior to future assignment as PLT then CDR. **[9]**

The selection of Griggs as an MS on this crew is interesting. By the fall of 1983, 22 of the 35 TFNG had received a flight assignment or had flown, and with another third of the group still awaiting assignment, it seemed for a while that several of the MS would fly before all of the pilots, some perhaps twice. To counteract this, with the Group 9 astronauts also becoming eligible for crew assignment and with Group 10 Ascans now in training, George Abbey decided to assign two of the pilots as MS-2 for their first missions. Thus, Griggs was assigned to the Bobko crew and Steve Nagel was named as MS-2 to the Brandenstein crew two months later.

In the same announcement, it was revealed that the payload for STS-41F would be classified and the mission flown by the astronauts previously assigned to the cancelled STS-10 mission: Mattingly, Shriver, Onizuka and Buchli. STS-41G was to be commanded by STS-7 veteran Rick Hauck, the first TFNG pilot to receive a command seat which, after just one mission and only five years at NASA, was a significant achievement. Fellow TFNG Dave Walker would be his PLT, with two others, Anna Fisher and Dale Gardner, as MS. Rounding out the crew was MS Joe Allen (Class of 1967). This mission was planned for August 1984 on *Discovery*,

with the payload manifested to include three commercial satellite deployments: Telstar 3-C, Satellite Business Systems-D and Syncom IV-2, and an astronomy free-flyer called SPARTAN (Shuttle Pointed Autonomous Research Tool for AstroNomy).

Fig. 10.3: The October 16, 1983 rollout ceremony for OV-103 *Discovery* at the Rockwell factory in Palmdale, California, with the STS-12 (41D) crew present (on the podium in blue flight suits from far left: Hawley, Mullane, Resnik, and at far right, Coats and Hartsfield), as well as NASA dignitaries, employees and visitors. The Orbiter is positioned behind a reviewing stand, with Don Beall of Rockwell (at lectern) introducing Dr. Rocco A. Petrone, the president of the company. Members of the TFNG flew on each of the five operational Orbiters and were represented on the maiden flight crews of *Discovery*, *Atlantis* and *Endeavour*.

Delivering *Discovery*

Over in California, on October 16, 1983, following four years and nine months of construction and testing, Rockwell held the rollout ceremonies for the latest Orbiter, OV-103 *Discovery*, witnessed by the five astronauts of STS-41D (formerly STS-12) who were to crew this new vehicle on her maiden flight. “I remember the event pretty well, particularly as it rolled into public view for the first time,” recalled Steve Hawley 36 years later, “I recalled thinking that it looked clean and new. I had seen it before in the plant while it was being worked on and I’m sure I participated in some of the testing. The rollout made it seem real that we might actually get to fly it.” The crew was there to wave to the crowd and thank the

Rockwell workforce, and Hawley recalled that, at the time, there may have been a subset of the "Cape Crusaders" at Palmdale to participate in the activities, keeping the crew informed as the vehicle was completed and prepared for its move to the Cape. Hawley also reflected on the end of *Discovery*'s career following its retirement in 2011 after 39 missions over 27 years, and its relocation the following year to public display at the Steven F. Udvar-Hazy Center, Dulles, Virginia. "I have been to Dulles to see *Discovery*. My thought was how sad it was to see it as a display. I always felt a connection to *Discovery*, since I got to fly it for the first time. It was a great vehicle." **[10]**

On November 5, the new Orbiter was taken overland to Edwards AFB for transportation on the Shuttle Carrier Aircraft (SCA) to KSC, arriving on November 9. *Discovery* was lighter than the previous Orbiters, as much as 3.6 tons less than *Columbia*, benefitting from lessons learned during the construction and testing of the three previous vehicles. The weight-saving measures included using quilted Advanced Flexible Reusable Surface Insulation (AFRSI) blankets rather than white Low temperature Reusable Surface Insulation (LRSI) tiles, and the use of graphite epoxy instead of aluminum for the payload bay roofs as well as in some of wing spars and beams. After it arrived at KSC, workers began preparing the Orbiter for its first mission (STS-41D) and completed modifications (along with *Challenger*) to enable it to carry and deploy the liquid-fueled Centaur G upper stage.

Even more assignments

By November 1983, with an increase in the planned launch manifest, NASA announced the crews for STS-41G, 51A, 51C and 51F, as well as a launch ready crew, bringing the total to 12 crews in various stages of mission training for flights planned over the next 18 months. **[11]** The schedule drawn up at this time can be seen in Table 10.2

In this schedule, Rick Hauck's original STS-41G crew now moved to 41H, the Bobko crew from 41E to 41F and Mattingly's DOD crew moved again, this time from 41F to 41E. A new crew was named to STS-41G, with Bob Crippen as CDR (though he was yet to fly as CDR for STS-41C), Jon McBride as PLT, and Kathy Sullivan and Sally Ride as MS, together with David C. Leestma, the first of the Group 9 astronauts to receive an assignment. Crippen would trial a short-duration training profile intended for later CDR and PLT to follow, to evaluate whether this could be a viable option to turnaround and re-fly the same flight deck crew (CDR, PLT and MS-2/FE) quickly in the future. It was also becoming increasingly evident that as the frequency of missions increased, so the time between them would diminish, meaning a CDR could fly a second mission much sooner, ideally after a shorter training turnaround, using their experience to compensate for the lack of training hours. This was exactly what Crippen would evaluate between STS-41C and 41G. The 41G crew announcement also meant that Sally Ride had the

TABLE 10.2: STS CREW ASSIGNMENTS (1984-85) NASA ASTRONAUTS ONLY [September 9, 1983, JSC]

STS flight	Primary payload	Planned Launch date	Commander	Pilot	Mission Specialists		
SPACE SHUTTLE FLIGHTS CALENDAR YEAR 1984							
41B	Palapa; Westar	January 29, 1984	Brand	GIBSON R.	McCandless	STEWART	McNAIR
41C	Solar Max; LDEF	April 4, 1984	Crippen	SCOBEE	NELSON G.	VAN HOFTEN	HART
41D	Telesat; Syncom	June 4, 1984	Hartsfield	COATS	RESNIK	HAWLEY	MULLANE
41E	DOD	Classified	Mattingly	SHRIVER	ONIZUKA	BUCHLI	
41F	Telstar; SBS, Syncom	August 9, 1984	Bobko	WILLIAMS D.	SEDDON	HOFFMAN	GRIGGS
41G	OSTA; ERBS	August 30, 1984	Crippen	McBRIDE	SULLIVAN	RIDE	Leestma
41H	DOD or TDRS-B	To Be Determined	HAUCK	WALKER D.	FISHER A.	GARDNER D.	Allen J.
51A	MSL; Telesat	October 24, 1984	BRANDENSTEIN	CREIGHTON	LUCID	FABIAN	NAGEL
51B	Spacelab 3	November 22, 1984	Overmyer	GREGORY F.	Lind	THAGARD	Thornton W.
51C	TDRS B or TDRS C	December 20, 1984	Engle	COVEY	BUCHLI	Lounge	Fisher W.
SPACE SHUTTLE FLIGHTS CALENDAR YEAR 1985							
51F	Spacelab 2	March 29,1985	Fullerton	GRIGGS	Musgrave	England	Henize
-	Stand-by Crew	TBD	Bobko	Grabe	MULLANE	STEWART	Hilmers

Group 8 astronauts are shown in CAPITALS.

opportunity to become the first woman to fly two missions, while Kathy Sullivan was scheduled to perform an Extra-Vehicular Activity (EVA, or spacewalk) with Dave Leestma, becoming the first American female to do so, and perhaps the first in the world.

In the same announcement, the STS-51A crew was named under the command of Dan Brandenstein, with Steve Nagel becoming the second pilot to fly as MS on his first mission. This was a notable crew for another reason, as the first NASA crew comprised entirely of Group 8 astronauts, (though Payload Specialists (PS) would be assigned later). In addition, Dave Griggs received his second assignment (though he was yet to fly his first), this time as PLT for STS-51F, while Bob Stewart was to be assigned to the first DOD Launch Ready Standby Crew[4], under the command of Karol Bobko, ready to take a military payload into orbit at short notice.

STS-9 [STS-41A] (November 28 – December 8, 1983)
Flight Crew: John W. Young (CDR), Brewster H. SHAW (PLT), Owen K. Garriott (MS-1), Robert A. R. Parker (MS-2), Ulf Merbold (PS-1, ESA, Germany), Byron K. Lichtenberg (PS-2, U.S.)
Spacecraft: Columbia (OV-102) 6th mission
Objective: 9th Shuttle mission; 1st flight of European-built Spacelab pressurized scientific laboratory (Spacelab 1/Long Module unit #1)
Duration: 10 days 7 hours 47 minutes 23 seconds
Support Assignments: The Astronaut Office support assignment list was missing from the source referenced by the authors. The mission was the first not to include members of the Class of 1978 in Capcom assignments, as all of them were in various stages of mission training, had recently flown, or were about to do so.

STS-9 became the first extended U.S. scientific research mission since Skylab a decade before. A total of 73 separate investigations were carried out in the Spacelab 1 module or Orbiter payload bay, in the fields of astronomy, physics, atmosphere physics, Earth observation, life sciences, material science, space plasma physics and technology. The crew divided into two 12-hour shifts, with the sole TFNG representative on the crew, Brewster Shaw, assigned to the Blue Shift along with Garriott and Lichtenberg, and the remaining crewmembers forming the Red Shift.

The crew of six became the largest so far to fly aboard a single spacecraft. It was also the first international Shuttle crew (with a crewmember from West Germany), and the first to carry Payload Specialists (from the U.S. and the European Space Agency, ESA). After ten days of Spacelab hardware verification and around-the-clock scientific operations, *Columbia* and its laboratory cargo (the

[4] It transpired that this would be the *only* DOD standby crew assigned in the program.

heaviest payload to be returned to Earth in the Shuttle's cargo bay) returned to land on the dry lakebed at Edwards AFB, California, completing the fourth mission of that year. NASA was confident that the next year would be much busier.

SATELLITES, SPACEWALKS AND SCHEDULES

Fig. 10.4: (top) Ron McNair plays his saxophone aboard *Challenger* during the STS-41B mission. (bottom) "Cecil B. McNair" taking a leading role.

On February 2, 1984, the day prior to the launch of STS-41B, NASA announced the crew assignments for two further missions. **[12]** Brewster Shaw, recently returned from STS-9, would next command the STS-51D mission scheduled for launch in February 1985. His four colleagues would be members of the 1980

selection. The mission would be the 21st of the Shuttle series and the ninth flight of *Challenger*, and would include the deployment of a Syncom communication satellite and the retrieval of the free-flying Long Duration Exposure Facility (LDEF) that was planned to be released during STS-41C in April 1984.

STS-61D was scheduled for a January 1986 launch, carrying the Spacelab 4 on the ninth mission of *Columbia* and focusing upon experiments in the fields of life sciences. John Fabian was named as MS-2 and Rhea Seddon as MS-3, with another of the Group 9 astronauts (Dr. Jim Bagian) as MS-1. This announcement also revealed NASA's policy on assigning crews to future Spacelab-type missions, with the intention of having three of the crew "share flight deck responsibilities." The CDR and PLT would be announced to join MS-2 Fabian at a later date. The announcement also stated that MS were "frequently selected earlier than flight crews, since their [science] training is more specialized and requires more time."

STS-41B (February 3–11, 1984)
Flight Crew: Vance D. Brand (CDR), Robert L. GIBSON (PLT), Ronald E. McNAIR (MS-1), Robert L. STEWART (MS-2), Bruce McCandless (MS-3)
Spacecraft: Challenger (OV-099) 4th mission
Objective: 10th Shuttle mission; commercial satellite deployment; 1st tests of Manned Maneuvering Unit (MMU)
Duration: 7 days 23 hours 15 minutes 55 seconds
Support Assignments: In the Astronaut Office memo dated January 4, 1984, the Group 8 mission support assignments for STS-41B included Brewster SHAW (CB Rep, MCC Support). KSC launch support was Dave WALKER as WX coordinator and Shannon LUCID as back-up ASP. LUCID was also on the Exchange crew for landing support, with WALKER again as WX coordinator. Jon McBRIDE would fly the Edwards Landing Pattern (ELP) WX T-38, while Anna FISHER led the PAO support team working with the NBS network and Jim BUCHLI worked with CBS. The Capcoms for this mission were all assigned from the 1980 Group 9 astronauts.

Unfortunately, while the mission was completed successfully, the flight was plagued by equipment failures. During their eight-day mission, the crew correctly deployed two Hughes 376 communications satellites. Westar 6 was for America's Western Union, while Palapa B-2 was for Indonesia, but both failed to reach their desired synchronous orbits due to upper stage rocket failures. Nevertheless, the flight was notable as the first in which astronauts tested the MMU, with both Bruce McCandless and Robert Stewart flying untethered up to several hundred feet from the Orbiter. During the first EVA (February 7), as McCandless ventured out 320 feet (98 meters) from the Orbiter, Stewart tested the 'workstation' foot restraint at the end of the RMS. On the seventh day of the mission (February 8),

both astronauts performed another EVA, again test-flying the MMU, to practice capture procedures for the Solar Maximum Mission satellite retrieval and repair operation which was planned for the next mission, STS-41C. These EVAs were the first untethered human operations from a spacecraft in flight. As well as undertaking the flight testing of rendezvous sensors and computer programs, the Canadian-built robot arm, operated by McNair, helped position the two EVA crewmen around *Challenger*'s payload bay by moving the platform on which the astronaut was standing, another first. This method of placing an astronaut in a specified position using the robotic arm was used on subsequent Shuttle missions to repair satellites and assemble the International Space Station (ISS). While orbiting the Earth, accomplished saxophonist McNair fulfilled an ambition to become the first person to play the instrument in space. He had brought his own saxophone on the mission and managed to play a few numbers while circling the globe. The STS-41B mission ended with a perfect touchdown, making the first Shuttle landing on the purpose-built runway at KSC.

Fig. 10.5: Bob Stewart flies the untethered MMU during STS-41B.

Three days after the return of STS-41B (February 14), NASA named the PLT and two of the MS for STS-51K (Spacelab-D1). **[13]** Steve Nagel would fly his second mission, this time as PLT, with Guion Bluford assigned as MS-3 and Group 9 astronaut Bonnie Dunbar as MS-1. The CDR, MS-2 and the European crewmembers would be announced at a later date. Spacelab-D1 was a dedicated mission purchased by the Federal Republic of Germany, with a science program focusing on materials and life science experiments. The mission was planned for launch in September 1985 on the third flight of *Atlantis* and the fourth flight of a Spacelab Long Module.

Later that month, the tribulations of the Mattingly DOD crew in trying to remain assigned to a mission, let alone leave the launch pad, persisted when the STS-41E mission was cancelled and the crew (including Shriver, Onizuka and Buchli) stood down again pending reassignment.

STS-41C (April 6 – 13, 1984)
Flight Crew: Robert L. Crippen (CDR), Francis R. SCOBEE (PLT), Terry J. HART (MS-1), George D. NELSON (MS-2), James D. A. VAN HOFTEN (MS-3)
Spacecraft: Challenger (OV-099) 5th mission
Objective: 11th Shuttle mission; deployment of Long Duration Exposure Facility (LDEF); capture, repair and redeployment of Solar Max satellite
Duration: 6 days 23 hours 40 minutes 7 seconds
Support Assignments: The support assignments for this mission were listed in an Astronaut Office memo dated March 13. Assignments for the Group 8 astronauts were: Brewster SHAW (Mission Operations Control Room (MOCR) Representative, MCC Support); Jon McBRIDE (WX T-38 pilot); John CREIGHTON (CBS PAO Support); Dan BRANDENSTEIN and Steve NAGEL (Family Escorts).

This was the most ambitious Shuttle mission to date in the program. During their seven-day mission, the crew successfully deployed the LDEF, retrieved the ailing Solar Maximum (Solar Max) Satellite, repaired it aboard *Challenger*, and replaced it in orbit using the RMS. The retrieval of Solar Max did not go to plan after the intended method of capture – Pinky Nelson flying the MMU and intending to use the chest-mounted T-pad docking device – failed. Nelson's attempt to steady the Solar Max satellite manually resulted in it becoming even more unstable, but fortunately the controllers managed to regain sufficient control of the satellite overnight to enable it to be captured by the RMS and brought into the payload bay for repair. The mission also included flight testing of the MMU over two EVAs (April 8 and 11), operation of the Cinema 360 and IMAX Camera Systems, and the Bee Hive Honeycomb Structures student experiment. Their mission was extended by a day due to problems capturing the Solar Max satellite, with the landing on April 13 taking place at Edwards AFB instead of at KSC as originally planned, due to forecast bad weather at the Cape.

Flight Control Operations Directorate (FCOD) Manpower Requirements
A presentation by the Astronaut Office on April 27, 1984, indicated the extent to which the office was stretched, with crews in training, crews just off a mission (STS-41B including Gibson, McNair and Stewart), and new astronaut support roles that the TFNG were involved with. Brewster Shaw was now Astronaut Office Deputy for Operations, with Joe Engle, and was also assigned to the Operation

and Training Branch with Vance Brand. Also within this branch was Steve Nagel, working on Shuttle Mission Simulator (SMS) issues. Ron McNair was assigned to Science and Technology payloads, Bob Stewart was working in the DOD Coordination Branch, and Loren Shriver had been detailed to the System Development and Test Branch with assignments relating to systems development for improving the Orbiters' General Purpose Computers (GPC). Steve Nagel was detailed to track the Digital Auto Pilot system under development as part of the Orbiter Experiment Program (OEX DAP). John Fabian was detailed to the Mission Development Branch as lead in Deployment Systems and was also working on the Centaur upper stage with Shannon Lucid. Fabian was given further assignments with Payload Accommodations (Payload Data and Retrieval System, PDRS) and Mission Integration, while any Spacelab issues were taken up by Lucid.

Shortly after STS-41C came home, the STS-41H mission was cancelled and the crew, led by Hauck and including Dave Walker, Dale Gardner and Anna Fisher, were stood down temporarily pending reassignment to a new flight.

First to depart

On May 10, a month after flying on STS-41C, Terry Hart announced his intention to retire from NASA, effective June 15, and return to take a position in an engineering management role for the newly-formed Military and Government Systems Division of his previous employer, Bell Laboratories, in Whippany, New Jersey. **[14]** This division produced large digital communications networks for government applications. Hart thus became the first member of the Shuttle-era selections to depart the agency and the first of the TFNG to hang up his spacesuit.

The busy but frustrating summer of 1984

On June 7, NASA announced the flight crew for the STS-51H/Earth Observation Mission 1. **[15]** For the first time since STS-6, none of the crew came from the Class of 1978. In the same release, astronomer and TFNG Jeff Hoffman was named to join the crew of STS-61E (Astro-1) in a partial crew announcement of three MS. Set for a March 1986 launch with a crew of six on *Columbia*, the mission included the deployment of the Intelsat-VI Comsat, and the Astro-1 astronomy package designed to view Halley's Comet. Hoffman's experience prior to joining NASA was in high energy astrophysics.

A very low MECO

Originally scheduled for launch on June 22, 1984, the maiden launch of *Discovery* (on STS-41D) was delayed by electrical problems for three days. Then, on June 25, a fault in one of the onboard computers halted the launch at T-6 minutes. The

following day, the count reached the point of starting two of the three Space Shuttle Main Engines (SSME), but they both shut down suddenly just 2.6 seconds later after the main fuel actuator in SSME #3 failed. The result was the first pad abort in the Shuttle program and the first for NASA since Gemini 6 back in 1965. Up on the flight deck, MS-2 Steve Hawley quipped "Gee, I thought we'd be a lot higher at MECO [Main Engine Cut Off]." The abort led to the reassignment of part of the original STS-41D payload, merging it with that of STS-41F. Yet another abort was called on August 29 due to computer software issues, but the next day *Discovery* finally left the pad to become the third operational Orbiter.

The consequences of the aborted STS-41D mission and fate of the 41F crew were reflected in the next manifest, released on August 3, which can be seen in Table 10.3. **[16]**

Things were changing once more, with the 41F (Bobko) crew stood down following the problems in getting STS-41D off the ground and reassigned to STS-51E, which was then scheduled for a launch in February 1985. The original flight of 41F was deleted and some of its cargo placed on the STS-41D flight, delayed due to the June launch abort. The formerly assigned DOD 41E (Mattingly) crew was reassigned yet again, this time to STS-51C, and the 41H (Hauck) crew to 51A. The former 51A (Brandenstein) crew moved to 51D, the previous 51C crew (Engle) now took 51G, and the 51D crew (Shaw) was reassigned to 51L. The STS-51K designation for Spacelab-D1 was erased from the manifest and replaced with STS-61A, while the Launch Ready Standby Crew (Bobko) remained unassigned to a flight.

STS-41D (August 30 – September 5, 1984)
Flight Crew: Henry W. Hartsfield (CDR), Michael COATS (PLT), R. Michael MULLANE (MS-1), Steven A. HAWLEY (MS-2), Judith A. RESNIK (MS-3), Charles D. Walker (PS-1, McDonnell Douglas)
Spacecraft: Discovery (OV-103) 1st mission
Objective: 12th Shuttle mission; maiden flight of Discovery; commercial satellite deployment
Duration: 6 days 0 hours 56 minutes 4 seconds
Support Assignments: The original Astronaut Office support listing for 41D had been released on May 23 prior to the pad aborts and was largely retained without change for the new mission. The assignments for Group 8 astronauts were: Brewster SHAW (MCC support in SPacecraft ANalysis, or SPAN), assisted by Dan BRANDENSTEIN and Bob STEWART; Loren SHRIVER (PAO support with NBC), assisted by Steve NAGEL (ABC) and Norm THAGARD (CBS); and Dick COVEY (Family Escort).

TABLE 10.3: STS CREW ASSIGNMENTS 1984-86 NASA ASTRONAUTS ONLY [August 3, 1984, JSC 84-036]

STS flight	Primary payload	Orbiter	Planned launch date	Commander	Pilot	Mission Specialists		
STS MISSIONS FOR CALENDAR YEAR 1984								
41D	OAST; SBS; Telstar; Syncom	Discovery	Aug. 24	Hartsfield	COATS	MULLANE	HAWLEY	RESNIK
41G	OSTA; ERBS; LFC	Challenger	Oct. 1	Crippen	McBRIDE	SULLIVAN	RIDE	Leestma
51A	Telesat; Syncom[1]	Discovery	Nov. 2	HAUCK	WALKER D.	FISHER A.	GARDNER D.	Allen J.
51C	DOD	Not listed	Classified	Mattingly[2]	SHRIVER	ONIZUKA	BUCHLI	-
STS MISSIONS FOR CALENDAR YEAR 1985								
51B	Spacelab 3	Discovery	Jan. 17	Overmyer	GREGORY F.	Lind	THAGARD	Thornton W.
51E	Telesat; TDRS-B	Challenger	Feb. 12	Bobko	WILLIAMS D.	SEDDON	HOFFMAN	GRIGGS
51D	LDEF retrieval; Syncom	Discovery	Mar. 18	BRANDENSTEIN	CREIGHTON	LUCID	FABIAN	NAGEL
51F	Spacelab 2	Challenger	Apr. 17	Fullerton	GRIGGS	Musgrave	England	Henize
51G	EASE/ACCESS; Telesat; Arabsat; Morelos	Columbia	May 30	Engle	COVEY	VAN HOFTEN	Lounge	Fisher W.
51L	EOS; TDRS-C; OASIS	Challenger	Jul. 2	SHAW	O'Connor	Cleave	Spring	Ross
61A	Spacelab D-1	Columbia	Oct. 14	Hartsfield	NAGEL	BUCHLI	BLUFORD	Dunbar
51H	Earth Observation Mission	Atlantis	Nov. 27	Brand	Smith M.	Springer	Garriott	Nicollier
STS MISSIONS FOR CALENDAR YEAR 1986								
61D	Spacelab 4	Columbia	Jan. 28	TBA	TBA	FABIAN	Bagian	SEDDON
61E	Astro-1	Columbia	Mar 6	TBA	TBA	Parker	Leestma	HOFFMAN
Standby Crew		-	-	Bobko	Grabe	MULLANE	STEWART	Hilmers

[1]STS-51A was listed as a dual option, either a civilian satellite deployment mission or a classified DOD flight.
[2]The 'classified' crew was not named in the memo but Mattingly's team had been reassigned from STS-41E.
Group 8 astronauts are shown in CAPITALS.

On this mission, Judy Resnik became the second American woman, and only the fourth in history, to journey into space. During their seven-day mission, the crew successfully activated the 102-ft (31 m) OAST-1 solar cell wing experiment, deployed the SBS-D, SYNCOM IV-2, and TELSTAR 3-C satellites, and conducted the student crystal growth experiment as well as photography experiments using the IMAX motion picture camera. McDonnell PS Charles Walker spent most of the mission on the middeck operating the CFES-III equipment (which he had to repair). Ironically, Walker was an unsuccessful applicant for the 1978 selection, but was now flying with four fellow Group 8 astronaut-applicants who had made it through the selection process. The 41D crew also earned the name "Icebusters" (the name and associated logo were in parody of the 1984 feature film *Ghostbusters*) after successfully removing hazardous ice particles from the Orbiter using the Shuttle's robotic arm. The problem had been caused by venting water from the Orbiter fuel cell system, which created a large chunk of ice on the exterior of *Discovery.* Using the RMS rendered the proposed contingency EVA by Mullane and Hawley unnecessary.

Refueling and retrieval

Barely a month later, the next Shuttle left the pad. One of the key objectives on this flight was to demonstrate the feasibility of refueling techniques by EVA, a key to future satellite refueling missions and to extending the operational lifetime of a spacecraft already on orbit. Depicted in pictures and articles about satellite servicing, maintenance and space station assembly over the years, these techniques were demonstrated on several Shuttle missions during 1984 and 1985 and became one of the Shuttle's key legacies over the next 25 years. On STS-41G, one of the TFNG, Kathy Sullivan, was once again right at the forefront of this new technique.

STS-41G (October 4 – 13, 1984)

Flight Crew: Robert L. Crippen (CDR), Jon A. McBRIDE (PLT), Sally K. RIDE (MS-1), Kathryn D. SULLIVAN (MS-2), David C. Leestma (MS-3), Paul D. Scully-Power (PS-1, U.S. Navy), Marc Garneau (PS-2, Canadian Space Agency (CSA))

Spacecraft: Challenger (OV-099) 6th mission

Objective: 13th Shuttle mission; scientific satellite deployment; Space Imaging Radar (SIR-B) experiments; satellite refueling demonstration (EVA supported)

Duration: 8 days 5 hours 23 minutes 38 seconds

Support Assignments: The Astronaut Office memo dated September 10, 1984, listed the mission support assignments for 41G, including those for Group 8 astronauts: Brewster SHAW (MCC Support Lead in SPAN Reps); Dan BRANDENSTEIN (SMS Support); Dick COVEY and Bob STEWART

(PAO Support); John FABIAN and Pinky NELSON (Family Escort). In the announced Capcom assignments, just two TFNG were named to the flight control teams, with Ron McNAIR listed on the Orbit 1 'Orion' team and Pinky NELSON on the Orbit 2 'Granite' team for the EVA. **[17]**

STS-41G carried the largest crew to fly on the same spacecraft to date (seven) and was the first mission to include two females on the same crew. During their eight-day mission, the crew deployed the Earth Radiation Budget Satellite (ERBUS), and conducted scientific observations of the Earth with the OSTA-3 pallet and Large Format Camera. On October 11, Kathy Sullivan became the first U.S. woman to perform an EVA[5] when she successfully conducted a 3 hour 30 minute spacewalk, alongside fellow MS David Leestma, to demonstrate the feasibility of future satellite refueling, using hydrazine fuel with the Orbital Refueling System (ORS) in the payload bay. During the flight, the crew also carried out numerous in-cabin experiments as well as activating eight 'Getaway Special' (GAS) canisters.

Two months after the previous announcement, NASA made further amendments to the manifest by naming a new crew and changing a previously announced assignment. **[18]** Five astronauts, Robert Gibson (CDR), Charles Bolden (PLT, Class of 1980), and MS Franklin Chang Díaz (also from the Class of 1980), George "Pinky" Nelson and Steve Hawley, were named to the STS-51I crew that was scheduled for launch in August 1985 on *Columbia*. The mission included the deployment of two communications satellites and operation of the Material Science Laboratory (MSL) material processing experiment.

The single crew change announced in the release was made to STS-51F, with PLT Dave Griggs replaced by Group 9 astronaut Roy Bridges due to the proximity of the two missions Griggs was assigned to (STS-51E and 51F), leaving him insufficient time to train adequately for both. Keeping to the schedule and retaining astronauts on their assigned crews and missions was becoming increasingly challenging, just a year into the new system.

STS-51A (November 8 – 16, 1984)
Flight Crew: Frederick H. HAUCK (CDR), David M. WALKER (PLT), Joseph P. Allen (MS-1), Anna L. T. FISHER (MS-2), Dale A. GARDNER (MS-3)
Spacecraft: Discovery (OV-103) 2nd mission
Objective: 14th Shuttle mission; commercial satellite deployment and retrieval
Duration: 7 days 23 hours 44 minutes 56 seconds

[5] Sullivan was just beaten to the accolade of being the world's first female to complete an EVA by Soviet cosmonaut Svetlana Savitskaya, who did so three months earlier. Savitskaya also usurped Sally Ride's chance of becoming the first female to make two space flights, having previously flown in 1982.

Support Assignments: Mission support assignments for 51A were listed in an Astronaut Office memo dated October 15, 1984, and included six members of the TFNG: Brewster SHAW (MCC Support Lead in SPAN Reps), supported by Robert GIBSON, Pinky NELSON and Ox VAN HOFTEN; Mike MULLANE (PAO Support with CNN); and Ron McNAIR (Capcom for Orbit 2 'Amber' flight team). **[19]**

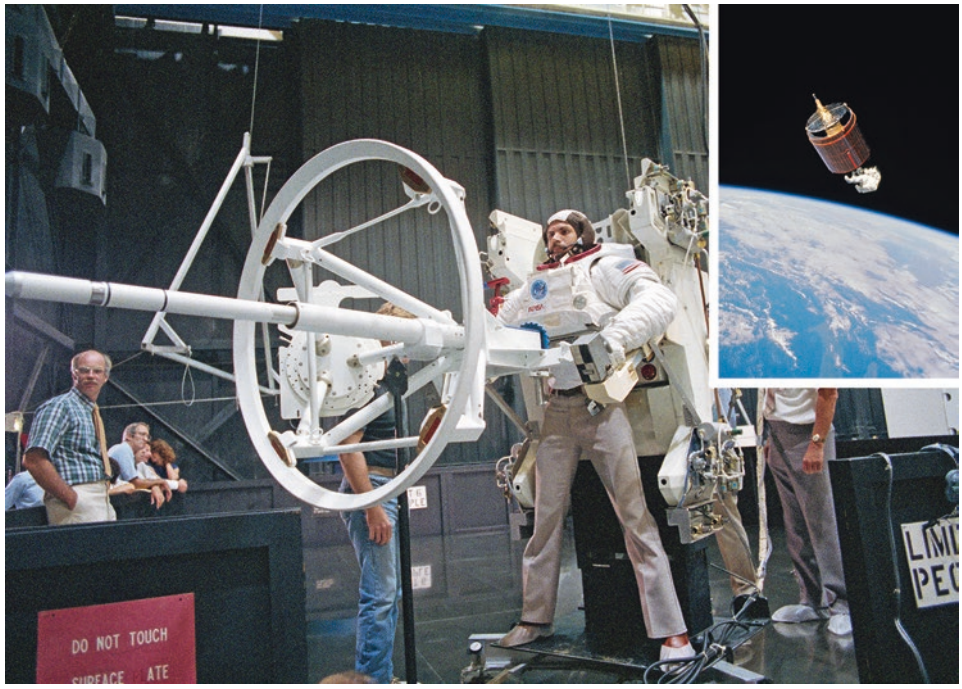

Fig. 10.6: (main) Dale Gardner in training with the Stinger/MMU combination. (inset) Gardner puts his training into practice by capturing the Westar satellite using the 'stinger' while flying the MMU.

Anna Fisher had been assigned to the crew just two weeks before delivering her first daughter and was launched 14 months later, making her the first mother to fly in space. During the mission, the crew deployed Canada's Anik D-2 (Telesat H) and the Hughes LEASAT-1 (Syncom IV-1) satellites, and retrieved the Palapa B-2 and Westar VI satellites for their return to Earth, the first space salvage mission in history. Joe Allen and Dale Gardner successfully captured and secured the two satellites, with the two men completing two EVAs in a little more than 12 hours. This included Gardner becoming the sixth and last person, and the fourth Group 8 astronaut, to free-fly the MMU during the second spacewalk, in which he captured the Westar satellite. During both EVAs, Anna Fisher assisted the recovery of the satellites by taking control of the RMS robotic arm from the aft flight deck of *Discovery*.

A BUSY YEAR: 1985

NASA had hoped to fly eight or possibly nine missions during 1985, and as many as 12 the next year. While this would be operationally challenging, there was also the question of training crews to meet those requirements. In 1985, the training system could only handle six crews at a time, so it became necessary to assign the crew as close to launch as possible, no more than about a year in advance. That year was split between six months of general training and then six months dedicated mission training, while all the time keeping up with the constantly changing manifest and schedules. This all made achieving a standardization of crewing almost impossible. The idea from headquarters that a CDR-PLT-MS-2 team could fly more than a couple of missions a year seemed very unlikely, and even assigning MS teams to standardize science missions on Spacelab, or IUS-dependent missions, was likely to consume months of training. On top of this was the ever-present risk factor in flying the Shuttle and the clear indication that each mission was a unique and complicated entity it its own right. There was nothing 'standard' or 'routine' about any Shuttle mission.

By 1985, most of the TFNG had flown in space at least once, a few twice, and all the remainder were in training for their maiden missions. At the same time, members of the 1980 selection were now available for their first assignments, allowing some of the more experienced TFNG to take more senior roles on their next missions and to think about the next moves in their careers.

STS-51C (January 24 – 27, 1985)

Flight Crew: Thomas K. Mattingly II (CDR), Loren J. SHRIVER (PLT), Ellison S. ONIZUKA (MS-1), James F. BUCHLI (MS-2), Gary E. Payton (PS-1, USAF Manned Spaceflight Engineer (MSE))
Spacecraft: Discovery (OV-103) 3rd mission
Objective: 15th Shuttle mission; 1st classified Department of Defense (DOD) mission
Duration: 3 days 1 hour 23 minutes 23 seconds
Support Assignments: Interestingly, despite the secrecy surrounding this flight, an internal Astronaut Office memo dated January 3, 1985 revealed which of the TFNG were fulfilling support roles: Bob STEWART (MCC Support Lead SPAN Rep), assisted by Jon McBRIDE; Mike MULLANE and Ron McNAIR (Capcoms, no Flight team details released); Steven Hawley (Exchange crew, Edwards AFB); Brewster SHAW (Family Escort)

STS-51C was the first fully-classified American space flight with a crew, with many of the Shuttle's objectives and its payload shrouded in deep secrecy, although the flight of the first USAF MSE was announced in advance. The DOD part of the mission was completed successfully and included the deployment of a modified

IUS vehicle from *Discovery*'s payload bay. The payload has subsequently been identified as an Aquacade ELINT (ELectronic signals INTelligence satellite). On this flight, Ellison Onizuka became the first American of Japanese ancestry (and the first Buddhist) to fly in space. For the first time, due to the unprecedented security surrounding the mission, the exact roles or crew assignments each astronaut completed were not divulged, setting a pattern for most of the subsequent classified DOD Shuttle missions.

End of year flight assignments

On January 29, two days after the return of STS-51C, NASA named two crews for end-of-year missions in its first crew announcement of the year. **[20]** The crew for STS-51L was changed from the Shaw crew to one led by Dick Scobee, with Mike Smith (Class of 1980) as PLT and Judy Resnik, Ellison Onizuka and Ron McNair as the MS. STS-51L was intended to launch in November 1985 on *Atlantis* carrying TDRS-C and was, according to the news releases, "an opportunity to re-launch one of the communications satellites retrieved from orbit during the flight of 51A" in November 1984.

The second crew was assigned to STS-61C, planned for a December 1985 launch on *Columbia*. The mission was manifested to deploy two communication satellites and operate the MSL, as well as conducting the EASE/ACCESS space manufacturing structure EVA experiment. In command of this mission would be Mike Coats, with fellow TFNG Norman Thagard and Anna Fisher as MS. PLT John Blaha and MS Robert Springer (both from the Class of 1980) completed the crew. In the same announcement, NASA identified the flight deck crews to go with two complements of MS announced earlier. Dave Griggs was named as PLT for the January 1986 STS-61D/Spacelab 4 mission along with CDR Vance Brand (Class of 1966), while Jon McBride was named as CDR for STS-61E in March 1986, along with PLT Richard Richards (Class of 1980). The original STS-51L crew led by Brewster Shaw was reassigned to an "unspecified mission."

Two DOD crews were named the following month, on February 15, including the first crew scheduled to fly from the Vandenberg AFB in California. **[21]**. STS-62A was to be commanded by Shuttle veteran Bob Crippen, with Guy Gardner as PLT and Jerry Ross as MS (both from the Class of 1980), along with TFNG Dale Gardner and Mike Mullane. In the same release, the former DOD Standby Crew was finally assigned to a mission, STS-51J. Karol Bobko would command the mission, with PLT Ron Grabe, MS Dave Hilmers (both of them also from class of 1980) and TFNG Bob Stewart making up the NASA crew.

The Saga of 51E/51D

The month of March 1985 did not start too well for NASA. On the first day, NASA cancelled STS-51E after continued problems with the TDRS satellite were revealed early in the year. The crew was stood down while a revised plan was

conceived. Five days later, on March 6, they had their new mission. As the Bobko crew was the priority crew in training, they were reassigned to STS-51D, taking a combination of the 51E and 51D payloads with them and yet again creating a ripple effect in reassigning crews. The Brandenstein crew moved to 51G, which in turn moved the Engle crew to 51I. The ongoing problem with TDRS were the source of a whole sequence of events and manifest changes which followed, including some of the planned DOD missions. There was also a requirement to fly the Bobko crew as soon as possible, to preserve the training schedule for his next mission, 51J, and the remaining flights for the year.

Later that month, in yet another revised and short-lived manifest dated March 25, a new mission briefly appeared as STS-51E (R – for Revised) which was under consideration for a rapid launch between May and September 1985 to deploy the much needed second TDRS (TDRS B) communication satellite prior to the Spacelab-D1 mission that October. This mission was assigned a minimum three-person crew, provisionally identified as Vance Brand (CDR – Class of 1966 and one of the most experienced astronauts in the office), Dave Griggs (PLT) and Rhea Seddon (MS-2/FE). In the end this mission was not pursued, and it disappeared from the manifest as quickly as it had appeared. When asked about this idea, Rhea Seddon said that she had not heard anything about such a plan, though "we were left in limbo for quite some time after our flight was combined with [41D] ... [although it was] interesting to know something was being discussed." **[22]** It seems the suggestion never reached the astronauts concerned and most likely never left the office that created the manifests, underlining the caution that is sometimes necessary when linking paper trails to real events.

March 1985 also saw Rick Hauck assigned as Astronaut Office Point Of Contact (POC) in the project office for integration of the liquid-fueled Centaur upper stage into the Space Shuttle. "After 51A, I was assigned to be the Astronaut Project Officer for Centaur. Centaur was an upper-stage rocket that's very thin-skinned. It has a thin aluminum skin. It's pressure-stabilized, which means if it's not pressurized, it's going to collapse by its own weight. If it was not pressurized but suspended and you pushed on it with your finger, the tank walls would give and you'd see that you're flexing the metal. Its advantage was that it carried liquid oxygen and liquid hydrogen, which, pound for pound, give better propulsion than any other, than a solid-rocket motor. Shuttle was obligated to launch the Ulysses probe and the Galileo probe, both interplanetary probes, and they needed the most powerful rockets they could have, and there was [a] back and forth… could the Inertial Upper Stage launch them or couldn't it? And no, it couldn't.

"In any case, at some point the decision was made… we've got to use the Centaur, which was never meant to be involved in human space flight. And that's

important because rockets that are associated with human space flight have certain levels of redundancy and certain design specifications that are supposed to make them more reliable. Clearly, Centaur did not come from that heritage, so, number one, was that going to be an issue in itself, but number two is, if you've got a Return-To-Launch-Site [RTLS] abort or a transatlantic abort [Transoceanic Abort Landing, or TAL] and you've got to land, and you've got a rocket filled with liquid oxygen, liquid hydrogen in the cargo bay, you've got to get rid of the liquid oxygen and liquid hydrogen, so that means you've got to dump it while you're flying through this contingency abort. And to make sure that it can dump safely, you need to have redundant parallel dump valves, helium systems that control the dump valves, [and] software that makes sure that contingencies can be taken care of. Then when you land, here you're sitting with the Shuttle Centaur in the cargo bay that you haven't been able to dump [completely], so you're venting gaseous hydrogen out this side, gaseous oxygen out that side, and this is just not a good idea." **[23]**

On April 5, Steve Hawley and Kathy Sullivan, together with Bruce McCandless (Class of 1966), were named early to the STS-61J mission manifested to deploy the Hubble Space Telescope (HST). **[24]**. The selection reflected the requirement for experienced astronauts to accompany a scientifically important payload, and the extensive EVA program required to back up its successful deployment. That mission, at the time planned for 1986, would not fly until 1990, five years after the astronauts had been named to it.

Another new Orbiter is delivered

April 1985 also saw the arrival at KSC of NASA's fifth and last scheduled Orbiter, OV-104 *Atlantis*. The new vehicle had rolled out from the Palmdale facility on March 6, the same day the former STS-51E crew were reassigned to STS-51D. *Atlantis* had been transported overland to Edwards AFB on April 3 and was then airlifted to the East Coast, arriving at the Cape on April 13. With the delivery of *Atlantis*, NASA now had a fleet of four vehicles available (*Columbia*, *Challenger*, *Discovery* and *Atlantis*) to meet its manifest, allowing one to be taken out of the flight line occasionally for its routine maintenance period.

Mission after mission

During the spring and summer of 1985, there was a rapid sequence of four Shuttle missions in just 16 weeks, with nine missions launched in total across the calendar year. This was the most that NASA ever achieved in the Shuttle's 30-year flight history, with the eight launches in 1992 being the only other calendar year to come close to this. It was still far short of the envisaged 26 missions a year.

Fig. 10.7: (main) MS Rhea Seddon (right) supports fellow crewmembers Jeff Hoffman (center frame) and Dave Griggs (left, back to camera) as they don their EVA pressure suits for the first unscheduled spacewalk of the Shuttle program. (inset) Seddon had earlier put her surgical skills to good use in fabricating a "fly-swatter" device to be attached to the RMS during the EVA in an attempt to trip the trigger to reactivate the satellite.

STS-51D (April 12 – 19, 1985)
Flight Crew: Karol J. Bobko (CDR), Donald E. WILLIAMS (PLT), S. David GRIGGS (MS-1), Jeffrey A. HOFFMAN (MS-2), M. Rhea SEDDON (MS-3), Edwin J. 'Jake' Garn (PS-1, U.S. Senator); Charles D. Walker (PS-2, McDonnell Douglas)
Spacecraft: Discovery (OV-103) 4th mission
Objective: 16th Shuttle mission; commercial satellite deployment
Duration: 6 days 23 hours 55 minutes 23 seconds
Support Assignments: After the STS-51E flight was scrubbed, the Astronaut Office memo dated January 31, 1985, was simply hand-amended from 51E to 51D. Originally, the only Group 8 astronauts assigned to the flight control team for 51E were Ron McNAIR (Orbit 1 'Altair' team) and Mike MULLANE (Orbit 2 'Amber' team). **[25]** McNAIR was replaced for 51D, presumably to allow him to train full time for STS-51L, his place taken by Dave Leestma of Group 9. Mike MULLANE was reassigned to the Planning Shift on the 'Sirius' team. **[26]** Other assignments intended for 51E but reassigned to 51D were: Brewster SHAW (Lead in SPAN), with Pinky NELSON, Judy RESNIK and Sally RIDE; Dave WALKER (Cape Crusaders at KSC, and also KSC Exchange Crew with Mark Brown of

Group 10); Steve HAWLEY (PAO Support for CBS); Jon McBRIDE (Briefer to the guests of the NASA Administrator); Rick HAUCK (PAO Support for NBC back at Johnson Space Center (JSC)). Kathy SULLIVAN was originally assigned to the French CNES team for 51E, but when Patrick Baudry was reassigned to 51G she was taken off the 51D support team. **[27]**

STS-51D was launched exactly four years after STS-1 and on the 24th Cosmonautics Day celebrations of the 1961 launch of Yuri Gagarin in Vostok. During this week-long mission, Dave Griggs and Jeffrey Hoffman conducted the first unscheduled EVA of the space program (on April 16), in which they tried unsuccessfully to reactivate the malfunctioning Syncom IV-3/LEASAT-3 satellite. To aid in triggering the faulty spring on the side of the rogue satellite, Dr. Rhea Seddon used her surgery skills to fabricate a 'fly-swatter device' from onboard materials. The device was strapped to the end of the RMS, but while it successfully snagged the trigger it also broke, leaving the satellite stranded until another crew could repair it. The crew also conducted several medical experiments, activated two GAS canisters and filmed educational experiments exploring the physics of 'Toys in Space'. Discovery made the fifth Shuttle landing at KSC but suffered extensive brake damage and a ruptured tire during landing. This forced all subsequent Shuttle landings to be made at Edwards AFB, California, until the development and implementation of nose wheel steering once again made landings at KSC feasible.

STS-51B (April 29 – May 6, 1985)
Flight Crew: Robert F. Overmyer (CDR), Frederick D. GREGORY (PLT), Don L. Lind (MS-1), Norman E. THAGARD (MS-2), William E. Thornton (MS-3), Taylor G. Wang (PS-1), Lodewijk van den Berg (PS-2)
Spacecraft: Challenger (OV-099) 7th mission
Objective: 17th Shuttle mission; Spacelab 3 (LM-1) research program
Duration: 7 days 0 hours 8 minutes 46 seconds
Support Assignments: Only one member of the TFNG was assigned as a Capcom for this flight. Mike MULLANE worked console on the Orbit 3 'Polaris' team. **[28]** Unfortunately, the Astronaut Office Support Team list for STS-51B was missing from the references sourced by the authors.

Norman Thagard acted as MS-2 on this mission, assisting CDR Robert Overmyer and PLT Fred Gregory on ascent and entry. Thagard's duties on orbit included satellite deployment operations with the NUSAT satellite, as well as caring for the 24 rats and two squirrel monkeys contained in the Research Animal Holding Facility, which took considerable time and included clearing up loose floating feces from the cages. Spacelab 3, the second flight with the European-built Long Module, featured 15 primary experiments in the five disciplines of material and life sciences, fluid mechanics, atmosphere physics and astronomy. Once again a two-shift system was followed for the science program, with Thagard assigned to the Gold Shift with Gregory and van den Berg, while the others worked the Silver Shift.

A "Death Star" in the payload bay

On May 31, NASA released the names of two four-man crews assigned to missions of just three days in duration, in close proximity to each other and carrying the controversial Centaur upper stage. **[29]**. They became known as the Centaur missions. STS-61F would be commanded by Rick Hauck, leading three of the Group 9 astronauts (Roy Bridges as PLT, with MS Dave Hilmers and Mike Lounge) for a launch no earlier than May 15, 1986, to deploy the Ulysses (International Solar Polar) spacecraft. This would be the first mission to use the liquid-fueled Centaur upper stage, and the first deployment of a solar system probe from the Shuttle. The second mission, STS-61G, was to be commanded by Dave Walker, with fellow TFNG John Fabian and James van Hoften as MS, and Group 9 PLT Ron Grabe rounding out the crew. This mission was scheduled for launch on May 21, 1986, just six days after STS-61F, and would also use a Centaur to deploy the Galileo planetary spacecraft on its mission to explore the giant gas planet Jupiter and its system of moons. The close proximity of the missions was necessary to meet the stringent launch windows available to both solar system probes and the four-man crew limit was necessary due to the weight restriction imposed by flying the larger payloads. They would both be flown at just 105 nautical miles (74.97 km) altitude, the lowest a Shuttle had orbited, limited by the mass of the fully-fueled Centaur and its payload.

The Centaur upper stage was a risky payload that concerned the crews from the start, not least because of the fully-fueled stage positioned just behind them in the event of an abort. The Centaur was not a new upper stage, having flown for the first time in 1962, and its combination of liquid oxygen and liquid hydrogen offered far greater power for lifting payloads than either the Payload Assist Module (PAM) or the IUS used previously on the Space Shuttle. The mass of the payloads and the tight launch windows necessitated the use of Centaur, but the Astronaut Office was not happy about it.

"One of the things astronauts do is they start looking at the hardware and so on and so forth," recalled John Fabian. "So I went out to San Diego [California] and watched them working and came back and reported on what I saw." Fabian's concerns were not only about the number of workers in the contractor's clean rooms, but the level of care taken within those rooms. "I wasn't the first to raise concerns about the Centaur. Bill Lenoir had raised concerns about it, because it had a failure mode that, in the event of a return-to-Earth launch abort, if you couldn't vent the propellants overboard, the liquid hydrogen and liquid oxygen overboard, before you came back into the atmosphere for landing, the thing could blow up in the bay. John Young called it 'Death Star', so it had something of a reputation. **[4]**

"In retrospect," Rick Hauck explained in 2003, "the whole concept of taking something that was never designed to be part of the human space flight mission, one that had many potential failure modes, was not a good idea, because you're

always saying, 'Well, I don't want to solve the problems too exhaustively; I'd like to solve them just enough so that I've solved them'. Well, what does that mean? You don't want to spend any more money than you have to, to solve the problem, so you're always trying to figure out, 'Am I compromising too much or not?' And the net result is you're always compromising." **[23]**

Fig. 10.8: The five TFNG who crewed STS-51G are seen on the aft flight deck of *Discovery*. This was the first and only time that all the NASA crewmembers on a Shuttle flight came from the same selection group. (Clockwise from lower left): Brandenstein (CDR), Nagel (MS), Lucid (MS), Fabian (MS) and Creighton (PLT).

STS-51G (June 17 – 24, 1985)
Flight Crew: Daniel C. BRANDENSTEIN (CDR), John O. CREIGHTON (PLT), John M. FABIAN (MS-1), Steven R. NAGEL (MS-2), Shannon W. LUCID (MS-3), Patrick Baudry (PS-1, CNES, France), Prince Sultan Salman A. A. Al-Saud (PS-2, Saudi Arabia)
Spacecraft: Discovery (OV-103) 5th mission
Objective: 18th Shuttle mission; commercial satellite deployment
Duration: 7 days 1 hour 38 minutes 52 seconds
Support Assignments: Group 8 support assignments for STS-51G were identified in an Astronaut Office memo dated May 22, 1985: Loren SHRIVER (Lead in SPAN), with Anna FISHER, Robert GIBSON, Rick HAUCK and Sally RIDE;

Dave WALKER (KSC Launch Support Team/Cape Crusaders); Steve HAWLEY and Dick SCOBEE (Family Escorts). Other support assignments for this mission included Dave WALKER, Dick SCOBEE and Steve HAWLEY deployed to Edwards AFB for End Of Mission (EOM) activities, and Sally RIDE serving as Briefer for guests of the NASA Administrator at the Cape. **[30]** Two Group 8 astronauts were assigned as Capcoms for STS-51G. Mike COATS worked with Richard Richards (Group 9) on the 'Orion' team for both ascent and entry, while Mike MULLANE worked with Jim Wetherbee (Group 10) on the 'Sirius' team during Orbit 2 shifts.

The international crew, which included French astronaut Patrick Baudry and Saudi Prince Sultan Salman Al-Saud, deployed communications satellites for Mexico (Morelos), the Arab League (Arabsat), and the United States (AT&T Telstar). They used the RMS to deploy and later retrieve the SPARTAN satellite, which performed 17 hours of x-ray astronomy experiments while separated from *Discovery*. In addition, the crew activated the Automated Directional Solidification Furnace (ADSF) and six GAS canisters, participated in biomedical experiments, and conducted a laser tracking experiment as part of the Strategic Defense Initiative (SDI).

On the day NASA launched STS-51G, it also announced a new crew. **[31]** Loren Shriver was named CDR of STS-61I with PLT Bryan O'Connor and MS William F. Fisher (both from Group 9), together with Sally Ride and the first representative from the Group 10 Class of 1984 astronauts, Mark C. Lee. Scheduled for launch on *Challenger* no earlier than July 15, 1986, the crew was to deploy the Intelsat VI-1 and Insat 1-C communications satellites and carry the Material Science Laboratory-4 (MSL-4) payload.

Abort-to-Orbit

Though the next Shuttle mission, STS-51F, was the first since STS-6 two years and twelve missions earlier not to include a member of the 1978 selection among the crew, it was not originally intended that way. Dave Griggs was initially assigned as PLT for the mission, but as mentioned, he was replaced by Roy Bridges (Class of 1980) due to the close proximity of his earlier mission. Following a successful launch, one of the three main engines failed during the ascent, forcing the crew to follow the Abort-To-Orbit (ATO) profile, the first (and only) such scenario in the entire Shuttle program.

STS-51F (July 29 – August 6, 1985)

Objective: 19th Shuttle flight using *Challenger* (8th mission); 8-day Spacelab 2 research program; verification of Spacelab Igloo/pallet configuration (the pressurized Spacelab Long Module was not carried on this mission).

Support Assignments: Despite the fact that none of the Group 8 members actually flew on this mission, eight of them did serve in various support roles, continuing the TFNG link with each Shuttle mission either in ground support roles or as a

member of the flight crew. **[32]** Loren SHRIVER continued as Lead for the SPAN team, supported by Anna FISHER, Norman THAGARD, Rick HAUCK and Sally RIDE. Dave WALKER continued his role as Cape Crusader with the KSC launch support team and Pinky NELSON served as one of the Family Escorts at the Cape. Mike COATS was the only member of Group 8 to work on MCC. He was again assigned to the 'Orion' team as one of the Capcoms for Ascent and Entry.

During August 1985, Don Williams became Deputy Chief of the Aircraft Operation Division, a role he fulfilled until August 1986.

STS-51I (August 27 – September 3, 1985)
Flight Crew: Joe H. Engle (CDR), Richard O. COVEY (PLT), James D. A. VAN HOFTEN (MS-1), J. Michael Lounge (MS-2), William F. Fisher (MS-3)
Spacecraft: Discovery (OV-103) 6th mission
Objective: 20th Shuttle mission; commercial satellite deployment; satellite capture, repair and redeploy
Duration: 7 days 2 hours 17 minutes 42 seconds
Support Assignments: For this mission, Mike COATS served as Lead Capcom, with fellow Group 8 astronauts Fred GREGORY, Shannon LUCID and Pinky NELSON serving on different MCC shifts during the EVAs. Other support roles listed included: Loren SHRIVER (Lead in SPAN), with Dale GARDNER, Jeff HOFFMAN, Rhea SEDDON and alternates Mike MULLANE and Sally RIDE; Dave WALKER and Dan BRANDENSTEIN (KSC Launch Support/Cape Crusaders); Rick HAUCK (Family Escort); Rhea SEDDON (Briefer for Headquarters guests). **[33]**

Intending to capture, repair and redeploy the faulty LEASAT-3 originally released from STS-51D, this crew first had to deploy its own satellite cargo, the Australian Aussat-1 and ASC-1 owned by the American Satellite Company, on the first day of the mission. A third satellite, another LEASAT, was released later. The first EVA on September 1 saw Ox van Hoften, the largest astronaut in the office, manually grab the satellite and hold it in place while Dr. Bill Fisher attached a grapple bar so that the RMS could be attached. The next day, the two astronauts repaired the satellite by performing 'bypass surgery', before van Hoften became the first human being to launch a satellite by hand, having spun and pushed the repaired communications satellite away from the orbiting *Discovery*.

More assignments, changes and departures.
Several crew assignments were announced on September 19, some of which involved the Group 8 astronauts. **[34]**. Dave Griggs and Bob Stewart were added to the rescheduled EOM/STS-61K mission, now set for a launch in September 1986. Don Williams was named as CDR for STS-61I, which was scheduled to

retrieve the LDEF satellite and deploy the Intelsat V-1 communication satellite. He would be joined by a crew of Group 9 and 10 astronauts. There were also changes made to crews of other flights. Norman Thagard was moved from STS-61H to STS-61G replacing John Fabian, who had announced his intention to retire from NASA effective January 1, 1986, and return to the USAF, while Jim Buchli replaced Thagard on his former mission. The former 61I crew commanded by Loren Shriver was reassigned to STS-61M.

STS-51J (October 3 – 7, 1985)
Flight Crew: Karol J. Bobko (CDR), Ronald J. Grabe (PLT), David C. Hilmers (MS-1), Robert L. STEWART (MS-2), William Pailes (PS-1, USAF MSE)
Spacecraft: Atlantis (OV-104) 1st mission
Objective: 21st Shuttle mission; 2nd classified DOD Shuttle mission; maiden flight of Atlantis
Duration: 4 days 1 hour 44 minutes 38 seconds
Support Assignments: Once again, despite the secret nature of the payload and mission, details of some of the support roles were released in an Astronaut Office memo dated September 19, 1985. Mike COATS again served as Lead Capcom, with Fred GREGORY and Shannon LUCID working other MCC shifts. Other support roles listed included: Loren SHRIVER (Lead in SPAN), with Dave GRIGGS, Ellison ONIZUKA and Norm THAGARD, with alternate John CREIGHTON; Dan BRANDENSTEIN (KSC Cape Crusader); Dave WALKER (Family Escort); Ellison ONIZUKA (Briefer for Headquarters guests).

This mission was the second highly-classified DOD mission, as well as the maiden voyage of *Atlantis*, the final planned Orbiter in the Shuttle fleet. During the flight, the crew is thought to have deployed two DSCS communication satellites.

STS-61A (October 30 – November 6, 1985)
Flight Crew: Henry W. Hartsfield (CDR), Steven R. NAGEL (PLT), Bonnie J. Dunbar (MS-1), James F. BUCHLI (MS-2), Guion S. BLUFORD (MS-3), Ernst W. Messerschmid (PS-1, DFVLR, West Germany), Reinhard Furrer (PS-2, DFVLR, West Germany), Wubbo Ockels (PS-3, ESA, The Netherlands)
Spacecraft: Challenger (OV-099) 9th mission
Objective: 22nd Shuttle mission; Spacelab-D1 (LM-2 unit), West German research program
Duration: 7 days 0 hours 44 minutes 53 seconds
Support Assignments: For this mission, Mike COATS again served as Lead Capcom, assigned with Fred GREGORY on the 'Gray' team for launch and entry phases. Shannon LUCID worked on the (lead) 'Indigo' team for Orbit 1, while Sally RIDE worked Orbit 3 with the 'Rigel' team. **[35]** Other support roles for this flight included: Loren SHRIVER (Lead in SPAN), with John CREIGHTON, John FABIAN and alternate James VAN HOFTEN; Dan BRANDENSTEIN (KSC

Launch Support/Cape Crusader); Dave GRIGGS (Family Escort). In the Astronaut Office Weekly Report w/e August 28, 1985, Loren SHRIVER was listed as a member of the EOM Support team at Edwards AFB.

This mission was the first to carry eight crewmembers, the largest crew to fly in space, and was a German-financed and dedicated Spacelab mission, the first to be chartered by another nation. The week-long flight was devoted to 76 scientific experiments in the fields of materials processing and life sciences. The Spacelab experiment operations were controlled by the West German DFVLR center, near Munich, using the TDRS-1 (originally known as TDRS-A pre-launch, but then renamed) and Intelsat satellites. With this flight coming ten months after his first mission, 51C, Jim Buchli became the first American astronaut to make two separate flights in a single year[6]. Ironically, a second astronaut on the same mission also achieved this rare event, as Steve Nagel was flying his second mission as PLT just 128 days after flying as MS on STS-51G, setting a new record turnaround. (Buchli was deemed to be the first, having flown his first mission earlier than Nagel.) Again, a two-shift operation was employed on this flight, with Nagel serving as Blue Shift leader and Buchli as Red Shift leader. Guion Bluford was also assigned to the Red Shift.

In November, the POC for aspects of the Flight Data File (FDF) were updated in an Astronaut Office memo, with effect from STS-61B and subsequent missions. Issues related to the Crew Activity Plan (CAP) and the Photo/TV Checklist were the responsibility of the specific crew on each flight, but the relevant Group 8 astronauts assigned (sometimes with members from other astronaut groups) as POC in this memo were: Rick Hauck (CDR, STS-61G) and Dave Walker (CDR, STS-61F) for Centaur Deploy; Ellison Onizuka for IUS deploy; Judy Resnik for PDRS Checklist; and Dick Covey for Rendezvous. **[36]**

STS-61B (November 27 – December 3, 1985)
Flight Crew: Brewster H. SHAW (CDR), Bryan D. O'Connor (PLT), Jerry L. Ross (MS-1), Mary L. Cleave (MS-2), Sherwood C. Spring (MS-3), Charles D. Walker (PS-1, McDonnell Douglas), Rodolfo Neri Vela (PS-2, Mexico)
Spacecraft: Atlantis (OV-104) 2nd mission
Objective: 23rd Shuttle mission; commercial satellite deployment; EVA construction demonstrations
Duration: 6 days 21 hours 4 minutes 49 seconds
Support Assignments: Capcoms for this flight included Fred GREGORY as lead, with Dick COVEY, Shannon LUCID and Sally RIDE. According to an Astronaut

[6] The first Soviet cosmonauts to achieve this feat did so in 1969. In January that year, Vladimir Shatalov had flown on Soyuz 4 and was joined during the mission by Alexei Yeliseyev following an EVA from Soyuz 5 on which he had launched. Both then flew together again on Soyuz 8 that October.

Office memo dated November 14, 1985, the Lead in SPAN was now assigned to John CREIGHTON, who was supported by Anna FISHER. Loren SHRIVER was one of the Family Escorts.

During this mission, the crew deployed the communications satellites, conducted two six-hour spacewalks to demonstrate space station construction techniques with the EASE/ACCESS experiments, operated the CFES experiment for McDonnell Douglas and a GAS container for Telesat, Canada, conducted several PS experiments for the Mexican Government and tested the OEX DAP. This was the heaviest payload weight carried to orbit by the Space Shuttle to date.

On December 17, NASA released the final crew announcement of a busy year, which would turn out to be the final such announcement for 13 months though of course this was not known at the time. The recently returned STS-61B CDR, Brewster Shaw, was assigned to command the STS-61N crew, a dedicated DOD mission scheduled for September 1986. The remaining crew consisted of Group 9 MS astronaut Dave Leestma, and Group 10 astronauts Michael McCulley (PLT), Jim Adamson and Mark Brown (both MS). **[37]** During the month, Dave Walker became the new Lead Cape Crusader at KSC.

MISSION IMPOSSIBLE

On January 1, 1986, John Fabian officially left NASA to take up a position as Director of Space, Deputy Chief of Staff, Plans and Operations, Headquarters, USAF, The Pentagon, Washington D.C. At the time of his decision to leave the astronaut program, he was in training as an MS for both STS-61G and SLS-1 and he was subsequently replaced on those crews by other astronauts.

STS-61C (January 12 – 18, 1986)

Flight Crew: Robert L. GIBSON (CDR), Charles F. Bolden (PLT), George D 'Pinky' NELSON (MS-1), Steven A. HAWLEY (MS-2), Franklin R. Chang Díaz (MS-3), Robert J. Cenker (PS-1, RCA), C. William Nelson (PS-2, U.S. Congressman)
Spacecraft: Columbia (OV-102) 7th mission
Objective: 24th Shuttle mission; commercial satellite deployment
Duration: 6 days 2 hours 3 minutes 51 seconds
Support Assignments: Group 8 astronauts assigned to MCC included Fred GREGORY as Lead Capcom on the 'Gray' team for ascent and entry, and Shannon LUCID on the (lead) 'Emerald' team for Orbit 1. Dick COVEY was also listed as Weather (WX) Capcom. **[38]** The Astronaut Office memo dated December 6, 1985 listed other support assignments as: John CREIGHTON (Lead in SPAN), with support from Dave GRIGGS, Loren SHRIVER and Kathy SULLIVAN among others.

Known as the 'end of year clear out flight' due to changes in the manifest, the mission carried only one small satellite for deployment. This flight also received the unfortunate tag of 'Mission Impossible', as it required eight attempts to get into orbit and was delayed twice in getting back on the ground. During the six-day flight, the seven crewmembers deployed the RCA SATCOM KU satellite, as part of a network of three satellites that would provide commercial communications services within the Ku-band of the electromagnetic spectrum. They also conducted experiments in astrophysics and materials processing. Unfortunately, a special camera designed to photograph Comet Halley failed, much to the disappointment of Pinky Nelson and Steve Hawley, the two professional astronomers on-board.

When *Columbia* touched down on Runway 22 at Edwards AFB on January 18, 1986 at the end of STS-61C, a productive six-day mission, the Space Shuttle program had completed 24 missions using NASA's fleet of four Orbiter vehicles. The landing had initially been delayed by a day, and then by bad weather at the Cape, before *Columbia* finally touched down at Edwards on the fifth attempt.

Although successful, the mission had gained a little notoriety in the press, as one of the seven crewmembers was C. William (Bill) Nelson II, who became the second sitting member of Congress (and the first member of the House) to travel into space following the flight of Senator Jake Garn on the STS-51D mission nine months earlier. There were continuing grumblings both within the astronaut corps and the American media about politicians exerting their influence to take precious seats on Shuttle missions, and neither man had been exempt from criticism.

SUMMARY

Flight records indicate that at the end of *Columbia*'s latest mission, all members of the TFNG group had successfully flown into space, amassing a total of 48 flights and with 15 having completed a second mission. Several of them had already been assigned to future Shuttle missions. Then, on the cold, frosty morning of January 28, 1986, just ten days after Hoot Gibson had glided *Columbia* to a safe landing at Edwards, everything would change suddenly and dramatically. On that day, Shuttle *Challenger* was poised to fly into space on what would have been the Orbiter's much-delayed tenth flight.

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