Space Shuttle

Feature

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Preflight Interview: Julie Payette, Mission Specialist **05.28.09**

This is the STS-127 interview with Mission Specialist Julie Payette. Julie, this year is the 40th anniversary of Apollo 11 and the first human steps on the moon. Can you give us a sense of how that event has maybe impacted you and maybe your decision to become an astronaut?

Canadian Space Agency astronaut Julie Payette, STS-127 mission specialist, uses a communication system during a training session. Photo Credit: NASA

I love telling the story in the U.S. particularly of how impactful the Apollo missions were outside the borders of the U.S. Of course, here it was extraordinary but it was an extraordinary feat for the entire world to watch. I actually don't remember Apollo 11 exactly because at the time I was five years old. The landing happened at night and the walk on the moon happened at night eastern time, and I asked my parents, my mom said I was probably asleep and so I just don't have any recollection. I do have recollection of the later missions to the moon. I remember sitting in my primary school gym and watching TV, all there, all the little kids. And we'd see the astronauts put on their spacesuit, get on the rocket. The rocket takes off and then we'd see them walking on the moon or driving that lunar jeep (always wanted to do that) and then we'd see them come back in their capsule and the parachutes open. I remember being in that gym and thinking, "This is so cool. I'd love to do that. This is what I want to do," and go home and say I'd like to be an astronaut but I'd say that in French 'cause I didn't speak a word of English at the time. And I was seven, eight, nine years old. It didn't cross my mind then that, you know, there were a couple of things that were a little far away from my reach at the time. I was not the same nationality as the people that were doing those Apollo missions. I was not the same gender. I didn't speak the same language. I certainly didn't, nothing was preparing me to have the same military pilot background, but it didn't matter and that was the power of exploration, of doing something beyond our reach, of pushing the envelope, is the fact that when we do something like that as human beings it impacts a whole generation of kids that want to do the same, that want to push the envelope, that want to strive for excellence, and it touched me back in Montreal when I was a kid. It didn't matter if this looked like something I could never reach. This is what I wanted to do so the impact of the Apollo mission on me has been immense and that's why I'm here today.

Back then, what did your parents say when you told them that. I mean, you being in Canada at that time, like you said, this was happening mainly for Americans and there was a space program that was very well rooted already but, I mean, that was a big hurdle. What did they say when you told them that?

Clearly when I first started talking about the fact that I wanted to be an astronaut, I was in primary school so people understand that we want to be all kinds of things then. It's not a big deal. But when it persisted and then I had posters on my door of astronaut missions, then of course my family thought, "That was interesting," and they would pat me on the back, smile a little. But the one thing they never did is discourage me from having that objective, that aim, that dream, and said, "Well, you want to be an astronaut? Okay. You may be the wrong gender or the wrong nationality, the wrong place. We, Canada doesn't have a single astronaut at the time. Our first one flew in 1984 on board the space shuttle. Well, then do what needs to be done. Go to school, study hard and go toward your objective, and who knows?" And that I think has been very important to me -- that even though this was kind of far-fetched, I was never told that it was silly. I was just encouraged to do, to say, "Hey, that's what you want to do? Well, go after it then, but don't think it's going to be easy or won't require any effort." And I'm very grateful today to my parents for never completely putting me down on this and trying to discourage me. They never did that and when in 1992 the Canadian Space Agency went on a recruitment program and I applied, nobody laughed back home. Everybody said, "Oh, yeah, well, this is what she has always wanted to do and hopefully she'll do well," and I got picked. So here I am.

Once you made that decision and had set your mind to it, tell us about the educational and professional steps you took to actually get there.

It's interesting when you want to become an astronaut in the 1980s, when we'd been in space only for like decades and there's no such thing as an astronaut school or a degree in becoming an astronaut. How do you become an astronaut? Again, if you're not in one of the two countries that had significant astronaut programs, the Soviet Union, then Russia, and the United States of

America, when you are a Canadian, what do you do to become an astronaut? At the time when I was deciding on what I would specialize in in high school and then what kind of subject I would study at college, Canada at the time did not have the first recruitment, so I just thought, “Well, I like science. I like math. And the chances that I will do this astronaut career are really, really slim so I might as well pick something that I really like to do ‘cause I’m, will most likely do this for the rest of my life or a big chunk of it.” So I knew I was destined for engineering. I like applied, mechanical, changing things, taking things apart, so for me it was almost a sure bet I would find myself there and so I picked electrical engineering as my major in college and that was in 1982. In 1983 Canada had its first recruitment of Canadian astronauts so even when I started picking my subject, it’s only later that the glimpse of maybe one day of being able to go into this career became true. But I didn’t have much hope and I didn’t think much about it. So I became an electrical engineer. I did some grad studies ‘cause I knew that would also help and this is something I wanted to do so there was always a balance between interest -- might as well like what you do if you’re going to have to put effort into it; it’s less painful and, in the back of my mind, “Hey, if there’s a recruitment program one day, if there’s an opportunity one day to apply, then I might as well put all the chance behind me,” and it was not a conscious decision. It was just like a bit of juggling and I juggled along, did my grad school, worked as an engineer, as a research engineer in various parts of the world and in 1992, when I had just come back from a one-year visiting scientist stay at a research lab in Switzerland, I saw an ad in the paper saying Canada was recruiting astronauts again for the second time in its history. So I looked and I thought, “My, I’m twenty-eight years old, it’s a little young. I only have two degrees, a Master’s Degree. I really have no operational experience. I’m not a military person. I’m not a pilot, but this is what I’ve wanted to do all my life,” and, you know, I’m a strong believer in statistics. If I do apply, I have a chance. If I don’t, I have a hundred percent chance of not being picked so I applied and, lo and behold, I went through all the steps and ended up being selected by the Canadians in 1992, sent to the NASA Johnson Space Center in 1996 to start my training as an astronaut candidate – an ASCAN. Graduated in ’98 and flew my first mission in ’99. Now I’m extraordinarily proud to be a crew member on STS-127 today and going to space again for a second time with such a great team.

Tell me about the place that you consider your hometown and what it was like growing up there.

I am from Montreal, Quebec, Canada. I was born there and I am a twelfth Montrealer. My dad, who likes genealogy, knows who was the first guy that came from France in 1655 and the guy settled in Montreal, and Montreal is an island where the city is in Quebec. So we’re about as old as it gets in terms of the European settlement in America. Sometimes people say, “Well, you’re not American,” and I say, “Well, I’m more American in terms of family heritage than most people around here.” So I grew up in Montreal. My parents grew up in Montreal and so forth and so on. But on top of it, we’re all from the same district. My parents lived across from one another on the same street when they were young and they liked each other and they got married at the church, the corner away, and they settled five streets further out and that’s where I grew up. So when I grew up, my two grandparents’ house were across the street from one another. That was perfect. All we had to do was to walk five feet to that street where the grandparents’ house were and then we could pick and choose which one had the best candy or would have the best program on TV or would yell the least and then we’d get there. So I basically grew up in a very tight family environment in the middle of a big city. Montreal, of course, is a very large city, is the second largest city in Canada after Toronto and it’s a mostly French-speaking city, though not completely. Most people speak both languages, not necessarily well, but certainly can go by in both languages. The one event that had a particular impact on me was that Montreal was the host of the 1976 Olympics and that event really had an influence on me, I think on very many people. I was thirteen years old and bless their heart, my parents decided to go and get tickets to different venues and different sports, not great tickets, bleacher tickets, but we got to see many things, judo, karate, track and field, water polo, at different places. So we just went everywhere. We were involved. We’d hang out by the training track and field outside the main Olympic stadium and see all these people that spoke all these different languages with different colors and it was just like extraordinary. The marathon went by my house, a couple streets down and me and my dad, that morning, we went and looked at the runners pass by. It was raining and, that morning, and that’s when I discovered there was a world out there and very intriguing, fascinating and I wanted to be part of that world. So not only I kind of wanted to be an astronaut but I wanted also to travel. I wanted to go and meet other people and I wanted to learn languages. And that influenced my choice again and almost from then on I rarely settled in Montreal. Montreal will always be my hometown. This is where I will always feel like home irrelevant of where I live, and I’ve lived in Houston, Texas, now for fourteen years. This is my home, too, but Montreal will always stay my home. But it’s also what gave me my interest in discovering this extraordinary world we’re a part of, so I’m grateful for the Olympics. I’m grateful for a tight family. I have roots, therefore, I can fly away from home and still be fine.

Tell me what experiences you remember from your previous spaceflight the most.

It’s hard to say one thing about a spaceflight. It is so amazing. First you take off in a rocket. Then you have to adapt to weightlessness. Then you do all these maneuvers so that you can dock to a space station. And then you open the hatch and go inside and you do some work and then you have spacewalks that you have to conduct. Then you detach yourself from the station and then you re-enter the atmosphere, you have the plasma overheating around you and then you land. And you guys want to pick one event out of such a place. It’s hard, though I would say that on my first mission, STS-96, we were the second mission to ever go to the space station, it had just been put together the flight before, two modules, Node 1 and one of the Russian cargo element, but we were the first team to manually fly the shuttle, the Commander to dock manually to the International Space Station and I was right behind the Commander in the cockpit as we were approaching and I couldn’t believe how close that structure was to the windows, the back windows of the cockpit of the space shuttle. It was amazing and it was coming in, of course, really slowly as we were preparing to dock with it. It was unbelievable. And it was so big. Compared to what it is today, it is really small what I saw ten years ago. It’ll be a complete different picture. What I saw [ten] years ago was two little elements. Now it’s the size of two football fields. It is going to be absolutely extraordinary to dock to the International Space Station this time around. So that I look forward to very much.

A fellow Canadian Space Agency astronaut, Bob Thirsk is scheduled to be on the station during your mission. He’s

going to be the first long duration space station astronaut for Canada. What's that experience and that milestone mean to Canada and to you?

Canadian Space Agency astronaut Julie Payette, STS-127 mission specialist. Photo Credit: NASA

Well, clearly for Canada this is a big historical moment and it is, however, normal evolution of a nation that invests in research and development, that partakes in collaborative projects for development and for pushing the boundary of knowledge, exploration. But because we're a smaller nation with less people, though we're a big nation but not with a huge population, then we have to pick and choose the projects that we partake in. So our space-faring stages have come along, one at a time, maybe not as fast as we have seen in Russia, in United States and now we're seeing in China. However, they are just normal evolution of a nation that invests in this kind of quest for knowledge. We were the third nation to actually build and launch a scientific satellite in 1962. We like to say that. It was called Alouette. And now, we had our first astronaut to go on board the space shuttle in 1984 and now we are going to have our first Canadian astronaut that will stay for a long period of time on board the space station; our first long duration astronaut, Bob Thirsk, who will stay for six months. That will be historical. Though in a hundred years from now people will look back and say, "Well, it was just the first time it happened," because, in a hundred years from now, there'll probably be two hundred or four hundred astronauts from Canada working, living or even just doing some tourism in space. But it has to start somewhere. The good news, though, is while Bob will arrive on station a little bit before the STS-127 mission, it'll be another historical fact that when I come and join him up there then there will be two Canadians on board. So, of course, this is important milestone. We will celebrate that and hope that that will then be a common thing in the years to come.

There are thousands of people that work behind the scenes to ensure the success of each mission and the safety of the crew. What's it like when you get a chance to meet these people and visit with them during training and traveling around to different centers?

I always feel very, very, very grateful and privileged to have the chance to fly in space. It's an amazing treat but I feel very lucky, but I know very well that I would never go anywhere if it weren't for the fact that I'm part of a team and that team is very large and most of them work on the ground to make sure that missions happen, that we build and explore in space and that our vehicles are well prepared and safe. And I am always very grateful and I always look for an opportunity to go and visit people, talk about our common goal 'cause I feel I'm part of their team and they're part of mine and to thank them for doing what they do. It's something that I wished we had more time to do even more. I worked a lot at Mission Control Center in between my two flights, and I really felt part of that ground team, that enormous ground team of very competent people that were preparing, overseeing, practicing and eventually executing, participating in real space flight and I felt that we are paramount to the success of the astronauts. Maybe a good analogy is the astronauts are just the tip of the iceberg, of this incredible operation. It's amazing that four decades after launching the first few satellites in the early sixties, that we are now able to build a space station in collaboration with other nations. That we can live permanently as human beings in space and that we are envisioning a possible mission to another planet and going back and settling colonies and work sites on the moon. We do this because of the dedication of that team that works together. So to me it's utmost important that we celebrate that fact just as much as we celebrate the astronaut. The astronauts are the visible part, a little bit, but they're far from being the most important part.

Could you give us a brief rundown of what the main, the key objectives of STS-127 are?

STS-127, I like to say, is one of the last major construction missions of the International Space Station. We're hoping that in two years from now it will be all complete and fully utilized as a scientific laboratory in space. So 127 is a heavy-duty construction mission. You have the construction workers, the crane operators and basically for sixteen days our mission is to install elements on the station, various ones with various reasons, to bring up a crew member and we're going to exchange a crew member, my colleague, Tim Kopra, who's part of my 127 crew, will stay on station and when we return on the ground we'll bring back one of the astronauts that has been there for a while, Koichi Wakata from the Japanese agency. And it is a hands on experience and, cleverly, my Commander, Mark Polansky, kind of separated the crew in two teams. One team will concentrate on every aspect of the spacewalk. It's not all they do but they're definitely responsible and are in charge of that aspect because we're going to do five spacewalks which is about the most we've ever done on a space shuttle and that's a lot of work and extremely demanding on the spacewalkers. So four of my colleagues are going to take care of all the preparation, all the training, all the equipment, the verification and the conduct of the spacewalks themselves. The other three are more in charge of the spacecraft itself, so the space shuttle, it's maneuvering, it's taking it to space on ascent, returning it to the ground on re-entry and all the maneuvers are required to dock and undock from the space station and so on, so really like cockpit stuff and robotics. Robotics is not exclusively on the shuttle crew. Some of the station colleagues that we have already on board will also be very important in some of our robotics operation but we will be operating at least one arm if not sometimes three the same day, fifteen days out of sixteen day mission. So it's a very heavy crane operation or space crane operation mission. So by doing that you can concentrate on training on the ground and people become very good at what they do and our objectives are really threefold: exchange the crew, install some of the elements that are, that need to be installed on the Japanese KIBO module, one of them is an external platform that will be used to expose scientific experiments to the vacuum of space, and then we're bringing some really big spare parts that we will stow on station for necessary use maybe one day, so if they are needed those spare parts will be up there and we're changing six batteries for our electrical system and that will basically be the bulk of the five spacewalks.

You are going to be heavily involved in the robotics yourself as an operator. You've had a chance to operate the shuttle robot arm in space before. Now you'll get a chance to operate the 'big arm', as it's called, or Canadarm2, once

you get up there. What's that feeling like being able to actually get your hands on the controls for that?

People often ask what I'm looking forward to do when I go on a second space mission and then I say, "Well, I'm curious about a couple things. I'm curious about how my body, if it will remember how to adapt to weightlessness or not." I'm looking forward to see the Earth from above again. This is such an extraordinary feat and privilege; it's magnificent seeing it from space. I look forward to experience weightlessness again. I look forward to dock to this immense space station as it will come into view from the space shuttle. But another thing I really look forward to is the opportunity to fly Canadarm2, the Big Arm like we call it. When I flew in 1999 on STS-96 we had the shuttle arm and I had the chance of operating that, but the Canadarm 2 didn't exist. The station was so small and it hadn't been installed yet. It was installed in 2001 by actually one of my Canadian colleagues and other people, Chris Hadfield. So now I have an opportunity to go and try the Canadarm2. The arms are quite different. The shuttle arm operates differently than the Canadarm2. They're not exactly made mechanically the same. They don't operate the same, so I'm really looking forward to see the difference and to be able to talk about it. This will be particularly fun, of course, because I'm Canadian and this is our big contribution to the International Space Station so I look forward to come back on the ground and talk about it.

Give us your best description, if you would, of the primary piece of hardware you're going to bring to the station, the "Jeff", the Japanese Exposed Facility and just tell us, kind of describe it. What is it? What's it about?

Inside the cargo of the space shuttle there are three main elements that we're bringing up to space and because we are in a program that absolutely loves acronyms, they all have acronym-type names. The first part, which is a platform, an external platform where we're going to put some scientific experiments so they can be exposed to the vacuum of space, is called the JEM Exposed Facility, JEF. So we, our crew, call it the "Jeff", simple. So that platform will be installed at the tip of a pressurized module, the Japanese pressurized module called KIBO. That module's already in space, was installed on board STS-124. So when we come, we'll pick it out, install it permanently at the tip of KIBO and this platform is exposed to the vacuum of space. We sometimes call it the 'porch' or the 'sundeck', so that's the "Jeff". The second element we have in our cargo bay is called the Vertical Cargo Carrier, lightweight cargo carrier, VCC. Well, that's too complicated for us. We call it the "Vic". So the "Jeff" and the "Vic". The "Vic" has a number of things on it. It's a cargo carrier. It's a platform that carries stuff. On it we have six batteries. We'll do an exchange of batteries during one, two of our five spacewalks and then we have three large, very significantly large, spare parts that we will install in station and that will stay permanently on station. So what we'll do with the "Vic" is we'll take it out with all its component on it, install the batteries, return the old ones, install the spare parts and then put the "Vic" back into the cargo bay before the end of the mission. We come back home with the "Vic". The third element in our cargo bay, it's called a Japanese Logistic Element, JLE. So we thought, "Ha, the 'Jelly'." So we have the "Jeff", the "Vic" and the "Jelly." On the "Jelly" we have three scientific experiments that have been devised by the Japanese Space Agency so the "Jelly" is also kind of a cargo carrier. We'll pick it out of the cargo bay, install it on the "Jeff" which we installed earlier during the mission, take, pick out the three experiment with the Japanese arm, install it on platform "Jeff" and when the "Jelly" is empty of its cargo, we'll take the "Jelly" and put it back in the space shuttle so we're coming back home with an empty "Jelly", an empty "Vic" and then an empty space where the "Jeff" was 'cause the "Jeff" stayed on station.

On Flight Day 1 you'll obviously launch on board Endeavour, make it to space and configure the shuttle for your stay in space. Then on Flight Day 2 there's some busy activities with some imaging of the orbiter. Tell us about what happens on Flight Day 2 and what you'll be doing.

Flight Day 2, we call it 'Inspection Day'. After the accident with space shuttle Columbia where there was a breach in the wing of the space shuttle that affected their ability to come back home, we now have a very specific procedure which we run on every single mission of the space shuttle by which we use the shuttle arm and an extension boom, which I'm happy to say was built in Canada just like the shuttle arm, and we pick out the extension boom which basically lengthens the shuttle arm and makes it twice bigger. And at the very tip of that extension boom is a package of very, very sensitive sensors that are able to image the leading edge of the wings, all the thermal protection system of the space shuttle as well as the nose and the wings themselves. So on Flight Day 2 the day is devoted to picking out the extension with the arm and then conducting those survey of the two wings and the nose cap of the space shuttle to ensure that there is nothing, there's no breach, that there was no debris that fell on the wing during the first part of the lift off and all that information is sent down to our imaging engineers on the ground who then look at it and will make sure that the orbiter is safe from that perspective. Clearly with this technique we cannot reach underneath the space shuttle so we need to wait until the next day to take pictures of the under belly of the space shuttle so that we can rule any breach or any holes in that part of the thermal protection system.

Okay. And tell us how that happens, the following day when you rendezvous and dock with the station. Tell us about those activities.

We conduct, therefore, the inspection on the second day and on the third day, as we're approaching the station, the only part we could not image and make sure that there is no holes or defect to the tiles and the thermal protection system of the shuttle is to expose that under belly to the astronauts who are on board the space station who with cameras will take very, very high definition pictures of the under belly and to do that it's the, a very cool maneuver. As we approach, you can imagine the station, we're both, of course, going on orbit at 28,000 kilometers an hour but as the shuttle comes underneath the station, there's a porthole here, a window. Astronauts are there with cameras, already prepared, and as the shuttle sits about six hundred feet below it will initiate a flip maneuver and do a three-sixty underneath that window where the space shuttle astronauts will, sorry, the space station astronaut will take pictures as the shuttle goes, completing a one-eighty, the under belly will be exposed and take pictures and it will do a full three-sixty and those pictures then will be again sent to the ground for analysis to make sure that everything is okay and then we'll continue our journey and dock to the space station a bit later than that.

Then on Flight Day 4 it's all hands on deck for the first of five scheduled spacewalks, as you mentioned. Tell us what the main goals of EVA 1 are and walk us through what you will be doing for that EVA on the inside.

Canadian Space Agency astronaut Julie Payette, STS-127 mission specialist, participates in a water survival training session. Photo Credit: NASA

One of the main objectives of our mission is to install the exposed facility, the platform on which scientific experiment will reside so they can be exposed to the vacuum of space, or we call it the "Jeff". And first spacewalk will be completely devoted to installing the "Jeff" onto the tip of the KIBO module. This is a very complex choreography between robotics and spacewalking. First the spacewalker has to prepare the "Jeff" so that it can be lifted off. We also have to make sure that once the "Jeff" gets at the other end that, if there's, they have to prepare also the interface on which the "Jeff" will, it's final resting place, it's final permanent install place. So we have a whole day where we do a bit of robotics and then they can then do some of the actions they have to do on the spacewalk and then we do a bit more of robotics. Another complex factor on the first EVA is the fact that no one arm can reach the platform from its place in the cargo bay all – in one go – move the platform, the "Jeff", from the cargo bay to its final install place. It's, there's no arm that's long enough. The only way to do this maneuver is to have Canadarm2, the station arm, pick out the platform from the cargo bay, lift it up, push it to the side. Then the shuttle arm comes with an operator at the other end, of course, pick it, and then grabs it. You can imagine this is space, weightlessness. We don't let go until we have a very, we are sure that some, one arm or the other is holding onto the platform itself. We call this a 'handshake'. But the operators of the two arms are not at the same place. One is in the shuttle and the other one is in the station so basically when the big arm moves the platform aside and the shuttle arm comes and grabs it, we basically grab it, both of us, and then when the other one has it then we can let go of the first one to make sure that we don't lose the platform up there. Then the shuttle arm will maneuver the platform a little closer while the Canadarm2, the station arm, changes position and goes and grabs it again and then install it. So we have to have a handover of the platform twice during that mission while a spacewalk is going on so this is going to be a busy, complex day but we'll rehearse it well on the ground so all should go well.

On Flight Day 5, one of the primary activities on the timeline is to do focused inspection. That may or may not happen. But you're also scheduled to pull another cargo [carrier] out of the payload bay. Tell us about those similar operations and more dual handoffs and whatnots? The ICC-VLD or the "Vic"?

The second, the Flight Day 5 which is basically our second full day docked to the International Space Station is devoted to setting up for the next EVA, and we may have to conduct some focused inspection if the engineers would like to see a particular part of the space shuttle that they're interested in. This may or may not happen. What is, interesting about this Flight Day 5 is that we do have to set up all the equipment for the second spacewalk. However, again, there's no one arm that can go and pick out something in the cargo bay of the space shuttle and directly install it where it needs to be on station. It's not long enough. We always, always have to do a handoff. We always have some choreography between two arms that will pass along a piece of equipment or a piece of cargo carrier because one cannot just switch. So again, on Flight Day 5, we'll operate, in this particular case, we'll pick out the cargo carrier, the "Vic", out of the cargo bay with the shuttle arm, pass it along to the station arm, make sure that both grapple before one lets go and then the station arm will install it on station in preparation for the second EVA.

EVA 2 - tell us what Dave Wolf and Tom Marshburn are scheduled to do on that spacewalk.

EVA 2 is devoted to the installing of three fairly big spare parts on the space station. Those spare parts will just be stowed there and if one day, years to come, we need those parts for replacement and they're quite big, like we have a pump module, we have an antenna module, then they'll be there. Ready if necessary, so during this mission Dave Wolf will be at the tip of Canadarm2 while Tom Marshburn is our free floater, the one that does a lot of the hands on work but also supervises all the movement of those masses. And we will fly the Canadarm2 from inside the station to position Dave Wolf from the carrier that he will pick out the spare parts to the stowage place. He's going to install them on station so he'll be at the tip of the arm carrying those elements around the entire day.

Okay, the next day could you walk us through briefly just the operations involved with getting the JLE to its temporary spot on the external facility.

On the Flight Day 4 we will install the platform, "Jeff", at the tip of the KIBO module. Sometimes we refer to it as the 'sundeck' or the 'porch' because it really looks like a house, the round, cylindrical house of a pressurized module of the station and then at the tip of it there's kind of like a horizontal platform that is exposed to the vacuum of space and the various changes in the sun, the night and the sun and night so we call it the 'porch' kind of thing. So it's the "Jeff". That we do early in the mission. On the "Jeff", the reason that the Japanese Space Agency built the "Jeff" is to put and install scientific experiments on it that will be exposed to the vacuum of space. So we need to bring those experiments up there and install them on the "Jeff" 'cause the "Jeff" comes in empty basically. Those, we have the first three of those Japanese experiments in our cargo bay of the space shuttle and we'll go about halfway during the mission, we're going to pick out the "Jelly", which is the logistics element of the Japanese, it's a carrier and on it we have three scientific experiments. We'll pick it out, hand it off again between two arms and install it, not permanently, just temporarily on the "Jeff" platform. Once it's there we will use the little arm of the Japanese module to go and pick out one experiment at a time, install it on the "Jeff" and then the second experiment, install it on the "Jeff" at a different location and the third experiment, install it on the "Jeff". By then, the logistic element, the "Jelly", will be empty so at the end of all this activity we'll pick out the "Jelly" cargo carrier empty and put it back in the space shuttle but we're

leaving the three experiments in space for long duration.

Then you mentioned earlier that this is going to be three arms in operation on this mission. You just touched on one, the Japanese module robotic arm's going to do that moving around of those scientific experiments. How big of a deal is that for JAXA and just as a space, for space station as a whole. I mean, this is a momentous event.

There's a lot of very exciting moments for the Japanese Space Agency during mission STS-127 and that makes sense. It's called also in the ISS talk, 2JA, and the J stands for 'Japanese-American Joint Mission' which it exactly is. When we will install the platform, the "Jeff" platform onto the tip of the KIBO module we will use a mechanism there that will be used for the first time so this will be a very important moment for the Japanese Space Agency. And then when we will use the "Jelly" to carry the three scientific experiments to install on the "Jeff", we will use for the first time in an operational manner their robotic manipulator, their small Japanese arm. We call it the small arm because in dimension it is smaller than the big Canadarm2 on the station or the shuttle arm and that arm is specialized to do exactly that, to move and install scientific experiment on the entire area, surface area of the "Jeff" and this will be a very special moment again for the Japanese as it is the first time they will be operationally using their experimental platform and their robotic manipulator at the same time.

Could you tell us about the robotic operations involved in EVA 3 and tell us what's going to be going on the outside with the spacewalkers?

On this mission with five spacewalks, two of our spacewalks will be devoted to the replacement of six battery elements at the very, very tip of the truss element of the station so we're going to be working very far away from where most of the modules are. On, and six batteries is quite a lot of work for the spacewalkers to exchange. What they do is they will take out the old battery. They exchange that, put in the new one and replace the old battery on the carrier and we'll take that back on the ground. This is for our electrical system to provide electricity for the station via our big solar arrays. We're unable in typical spacewalk of six hours to do six batteries in that time, so we will do the first four on the third spacewalk and the next two, if all goes well, on the fourth spacewalk, and all this will be done with assistance from robotics. It'll be my colleague, Doug Hurley, and I that will be at the helm of the Canadarm2, the big station arm doing those operations.

And robotically you and Doug will be actually moving the platform on the end of the arm to where the spacewalkers need it or how does, is there much, what's the complexity of that like?

Well, there's two choices. When you have a coordinator robotics spacewalking operation. You could have astronaut at the tip of the mechanical arm and move the mechanical arm with the spacewalker on the tip of it. That's one way of doing things. The other way is to have the spacewalker fixed on to his position on the space station and then you can have the robotic arm carry the equipment and then move that equipment so that you put it in the exact reach where the fixed spacewalker is waiting and in the case of EVA 3 and EVA 4, the third and fourth spacewalk of our mission, we are doing the second method. We have the six batteries in, on the cargo carrier called the "Vic" and we're carrying this and we are basically presenting to the spacewalker who's standing on a fixed position on the space station with the proper battery he needs to work with. So we're moving equipment and not the spacewalker and that works really well. But we do this on the command of the spacewalker so we will present that element as close as possible and then we'll let the spacewalker on EVA 3, on the third EVA, it's Dave Wolf. On the fourth EVA, it's Chris Cassidy. And that spacewalker will then direct the arm operator, me and Doug, to put the battery at the right place by saying, "Hey, a little left. Bring it toward me." This is rehearsed extensively on the ground because you can imagine there is very little room for error. We're very close to structure so as you move the arm you have to be very, very cognizant that there's a lot of things and we can't afford a collision of any sort.

Flight Day 14 you're scheduled to prepare for departure by, you will actually close the hatch that day and spend the night in shuttle, then undock the following day. Tell me about what you'll be doing for undock and fly-around.

The Flight 127, I'm the Flight Engineer. It's a great position. It's about the best position to be in from a Mission Specialist's perspective. The Flight Engineer just like typically in any aircraft in the Western World is the person that sits usually in between the Commander and the Pilot and assists in all the maneuvering and all the dynamic phases of flight and that's my position. So during the liftoff and during the re-entry into the atmosphere, I will be sitting right in the cockpit of the space shuttle in between the Commander and the Pilot. My responsibilities is to assist in all the maneuvers, to read checklists, to crosscheck actions and decisions that are made and to assist in trouble-shooting if there is anything that goes wrong or if there's any problems with any of the systems, so very typical Flight Engineer job. So during the docking to the International Space Station I'm an integral part of the team that does that while the Commander manually flies the space shuttle to that docking attitude and during the undocking, I am again the, do my role as a Flight Engineer and assist in the operation as our pilot will undock from the space station.

Forty years after Apollo 11 and the first human steps on the moon, we are in the midst of refocusing direction with a planned return trip to the moon and possibly even going on to Mars. What's it feel like to you to be part of that legacy and to be part of this big undertaking now that that's on the horizon? I mean, it's a big, big bold step to be taking.

I feel so lucky to be in this job and to be part of this extraordinary adventure 'cause it still is. In five hundred years from now when people are going to look back in the early years of 2000 when we're building our first really international space station, when we are thinking of maybe being able to go back to the moon for the second time in our entire history in a decade, people are going to say, "Oh, wow! Look at that!" They're going to kind of smile and laugh at the way we propelled ourselves to space and the way we did operations and how difficult it was and how long it took and eventually, of course, we hope to go to the closest, most hospitable planet around which is Mars but that, again, will take a while. But look [at] that from five hundred years

from now. We're going to think, hey, they didn't quite know what they were doing then. But it will still be looked at as first. It will still be looked at the first time when human beings pushed that environment of only their own planet and went in, and started to settle and to utilize worlds that were beyond their reach just a few decades earlier. It will be regarded as a very, very historical time when for the first time in our history, we set foot on a celestial body that is different from ours, in terms of going to another planet. I think this is so exciting that, to be part of this exploration, to be part of the team that will push that knowledge. I think it's very exciting and I think it's, those, I hope there's a lot of kids out there watching and wanting to join that team because we'll need a lot of people for a long, long time. There will always be something to explore and something to discover.

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Page Editor: Jeanne Ryba
NASA Official: Brian Dunbar