



The Museum of Flight Oral History Collection

The Museum of Flight
Seattle, Washington

Soyeon Yi

Interviewed by: Geoff Nunn

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Abstract:

Astronaut Soyeon Yi is interviewed about her engineering career and her experiences as the first Korean citizen to participate in a spaceflight mission. She discusses her academic work in mechanical engineering at KAIST (Korea Advanced Institute of Science and Technology) during the early 2000s and explains her motivations for applying to the Korean Astronaut Program during her PhD studies. Yi then describes her spaceflight experiences, including her training in Russia with Roscosmos, her time on the International Space Station, and her work with KARI (Korea Aerospace Research Institute) after returning to Earth. The interview concludes with a discussion of Yi's next career goals and her thoughts on the future of the Korean Space Program.

Biography:

Soyeon Yi is an engineer, scientist, and astronaut who, in April 2008, became the first Korean citizen to participate in a spaceflight mission. She was born on June 2, 1978 in Gwangju, South Korea to Gil-soo Yi and Geum-soon Jeong. Her father worked in a farmer's association bank until his retirement, and her mother was a homemaker. While in middle school, Yi was selected by the Education Office to participate in a special afterschool program for gifted math and science students. She continued her STEM-focused education at Gwangju Science High School and KAIST (Korean Advanced Institute of Science and Technology), where she earned bachelor's and master's degrees in mechanical engineering.

During her doctorate studies in biotech systems, Yi became interested in the government's search for candidates to serve as South Korea's first astronaut. She applied to the astronaut program and was selected as one of two finalists, along with Ko San. In 2007, she traveled to Russia to begin training with Roscosmos for a flight to the International Space Station (ISS). She was initially designated as the backup crewmember but was promoted to primary after Ko violated regulations at the training center.

On April 8, 2008, Yi and her crewmembers, Commander Sergey Volkov and Flight Engineer Oleg Kononenko, were launched from the Baikonur Cosmodrome (Kazakhstan) aboard the Soyuz TMA-12. They docked with the ISS two days later. While on the ISS, Yi oversaw a number of multi-disciplinary experiments on behalf of KARI (Korea Aerospace Research Institute). On April 19, 2008, after 11 days in space, she returned to Earth aboard Soyuz TMA-11 with Commander Peggy Whitson and Flight Engineer Yuri Malenchenko.

Following her return to Earth, Yi worked for KARI as a researcher and spokeswoman. She also attended the International Space University in France and earned a Master of Business Administration at the University of California, Berkeley. In 2014, Yi decided to resign from KARI to pursue other career opportunities. She settled in Washington State with her Korean-

American husband and became a college instructor. As of 2017, she was a volunteer at The Museum of Flight, participating in programs to promote STEM education.

Biographical information derived from interview and additional information provided by interviewee.

Interviewer:

Geoff Nunn is the Adjunct Curator for Space History at The Museum of Flight and also serves as an Exhibit Developer in the Museum's Exhibits Department. He holds a Master's degree in Museology (Museum Studies) from the University of Washington and has extensive experience working as an educator and exhibit developer at science and technology museums. At The Museum of Flight, he serves as the resident historian and curator for spaceflight, leading the Museum's efforts to document the past, present, and future of aerospace.

Restrictions:

Permission to publish material from The Museum of Flight Oral History Program must be obtained from The Museum of Flight Archives.

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Soyeon Yi

[START OF INTERVIEW]

00:00:00

[Introduction and personal background]

GEOFF NUNN: It is Tuesday, November 28th. My name is Geoff Nunn. We are here in the Charles Simonyi Space Gallery at The Museum of Flight doing an oral history with Soyeon Yi. So we're going to start with some really easy questions. Soyeon, can you please first tell us your name and spell it.

SOEYON YI: Oh, my name is Soyeon Yi. S-O-Y-E-O-N. That's my first name. And last name is Y-I.

GN: Okay. So pronounced "E"?

SY: "E," yeah.

GN: Okay, Soyeon Yi. And do you prefer to go by the first name/last name pronunciation or last—

SY: It doesn't matter.

GN: Doesn't matter? Okay.

SY: Yeah, yeah. It's cool—whatever you feel comfortable.

GN: Okay. And, Soyeon, when and where were you born?

SY: I were [sic] born 1978 in Korea. The name of the Gwangju, the small, little city, southwest.

GN: And did you grow up in that same town?

SY: Yeah. Around the area, yeah.

GN: And what were your parents' names and what did they do for a living?

SY: My mom is Geum-soon Jeong, and she was a housewife full time. And then my father's name is Gil-soo Yi, and then he was working in a farmer's association bank. So he's kind of like a banker for 30 years, and he's celebrating 30 years' service in a bank. And I was so impressed because nowadays not that many people is working in the same company for 30 years. And then retired right now, and they're enjoying their retirement life.

GN: Wonderful. And still in—

SY: Yeah, still in Gwangju. Yeah.

GN: Still in Gwangju. And when did you first become interested in space as—

SY: That is a really interesting question because I even cannot recognize it. But I found something and—yeah, I grew up with a small, little town. It's right next to the farming community. And my father is working for the farmers. We were not that kind of—quite civilized area at all. And I always mingling with the friends whose fathers and mothers are farmers. So I couldn't even think of the space. But around my childhood, it was a huge hit of the Japanese animation from the Japan to the Korea. It was translated or subtitled. And I don't know why, but most of the animation movies, they always themed in space. So some trains are going into the space. You can go to the Mars and Jupiter by the train. And I still remember that kind of animation, and I was so kind of fascinated with that. So my mom found it when I applied for the astronaut, and then I drew some kind of little drawing and then drew the trains going to the space. There was kind of Saturns and Mars and around the trains, and then I was on the window and big smile with my friends. So that was real interesting.

So finally, I realized that when I was a kid I was interested in space, but I totally forgot and has any kind of energy or interest to space because it was too much for us. And just studying in school as they kind of—managers—the course were never—in Korean kind of curriculum, you don't have that much electives during the middle school and high school. Everything's a requirement. Everything's kind of required course. So I had just followed the curriculum, so it doesn't have any kind of spare energy to think about space. But I realize that I loved math and science. So space is too much. [laughs] And, yeah, so that kind of thing.

But only when I read the newspaper articles and Korean government thinking about it and considering to find first Korean astronaut, and then I thought, oh, that would be cool. But not that kind of big interest. And they said if we picked the first Korean astronaut, maybe the person would be taking care of the experiment and then maybe that person would be a scientist or engineer. And then I was the future engineer, engineering school student, oh, that would be cool. Maybe I can try. So I was not that kind of huge space nerd [unintelligible 00:04:26]. I just close to them, kind of STEM, but not space. Yeah.

00:04:33

[High school and college years]

GN: And let's talk a little bit about your education, your high school. Because you said you grew up in this sort of rural farming community and your school was—tell us about where you went to school.

SY: Yeah, that's a good question because I grew up primary, middle school, you know, farming area, but during the middle school, I was categorized and then picked by the Education Office as a gifted student in math and science. So they had a special training for the gifted program after the school. So I have afterschool program under the Education Office. And during that education, I realized that there is a science high school in Korea. I've never heard it before. But I heard about that. And then, yeah, I liked math and science. Why not? So I just applied and take exam—really serious exam—and then got an admission.

But even getting admission, I should debating: should I go there or not? Because I've never thinking about to go into the STEM field until then. But my mom and dad was excited. And then some of my friends, they really want to go there, but they cannot get an admission, so I realize, oh, that's quite exclusive. Then maybe I can try. So I entered to the science high school. And that is a really, really STEM-specialized school, and more than half of the curriculum is about math and science. And they even covered all the college calculus and all the college physics. It was really fun. So that would be the huge bias for me to kind of turn to the STEM area.

GN: So you mentioned that you weren't really thinking about going into a STEM career.

SY: Yeah, I've never.

GN: What were you thinking about wanting to do with your life prior to that?

SY: Just kind of same as any other teenagers. You're always influenced by the friends around you. And when I was in middle school and primary school, everybody is always go back to their farming area right after school because their parents are so busy. But thank God my mom and dad is not a farmer, so I can enjoy my life. But I saw a lot of my friends doing that.

And once I entered to the high school and around that area, because of the small, little kind of team and cohort, they are all gifted science and math. And some of their parents are quite well educated. They had a good knowledge about the future. They already college graduate. They already have a doctor [doctorate?], and then they encouraging their kid, "You should go to science high school. You should go to engineering school, top 10 engineering school." And they poured information. But I don't have that information because my mom never go to the middle school. She's—final education was the primary. And then my dad also never go to the college. He graduate from the high school and then became a caller. So he's not really banker. He's more like a caller in a bank. And so they cannot influence me. They cannot inspire me at all. But they always told me, "Whatever you want you can try." And then they always told me, "Sorry, I cannot help you to find something because we don't have those kinds of resource." As a people who are really desperate to get an information, whatever information is really

valuable. So my friends throw the information away. They just throw the resource away. I just grab it. Oh, my God, that's so cool. And then my friends, they just required to read some book. They hate it, and they just leave it. And then I just ask them, "Can I read it?" And they say, "Oh, please. I don't like it." And I read it. Wow, that's really cool.

And so those friends influenced me a lot. And then sometimes I feel kind of—why they just throw them away? It's really valuable. But they cannot feel value because they kind of required to do that. They obligated to do that. Whatever really good thing you are obligated to do that, you just hate it. [laughs] But you really desperate to have one, even if it's not worth at all, seems really valuable. So those kind of dynamics and environments always motivate me and then I want to get more. I want to study more, even if I don't have a resource. I really want to read it. And sometimes I feel so kind of—how can I say—so excited because I don't have huge resource. I don't have a good family background. But my math scores are better than that guy's, even if his father is a professor. Oh, that's really cool. And then I feel so proud of myself, and it push me more and further. Soyeon, you can do it. You should approve of yourself. You are better. And, yeah, at that time I couldn't think of that. But when I looking back time, maybe I would act like that as a teenager. Yeah.

GN: And so this high school that you got into, was it nearby to where you lived or was it a boarding school—

SY: Yeah, it was a boarding school. Even if it's not that far from, the science high school basically should be boarding school. They are all gathered together, study together, until midnight usually—we should wake up and then study. It was quite kind of Spartan style of the—typical Korean style. [laughs] But it is okay. So like a military. If you have a colleague who do exactly same thing, you cannot feel tired. You just go to it as a group. So even if it's hard and even if it's really strict—but I can tell that it is most fun life of my life, even still now. Even compared with my astronaut training, that time is more fun. Because all teenagers, living together—for us, six months is almost like a camping, because I have never live with friends before. And even if it was really, really tough and some teachers are really, really crucial—public enemy—we are all together as a group, so we fight against them. But that was really fun, yeah.

GN: And so then moving from this science high school, where did you go to college and what was your course of study?

SY: Yeah. If you are in a science high school, you are totally biased, so only selection is engineering school, [unintelligible 00:10:38] school in Korea. And all the science high school teacher push you. "You should go top five or top three and the number one engineering school in Korea because you guys are good—" [unintelligible 00:10:50] the science high school, we are kind of brainwashed. [laughs] So even if there's more than

thousands university in Korea, we only have at most 10 selection, top 10 thing, and at most five selection.

So I was totally biased. And should think about financial status, also, because think about tuition and life expense. Already second-year, third-year high school students, you should think about that. And I also should think about that, so I realize that it may be too much and too expensive to go to the Seoul—to go the Seoul National University, because not only tuition but also living expense and renting and everything's more expensive. But thank God in Korea is a Korean version of the MIT, but different from the MIT, is the Korean—Korean MIT is called KAIST, Korean Advanced Institute of Science and Technology, so government-subsidized school. So if you have a certain level of the GPA, you have a full scholarship and guaranteed. And if you have a higher than certain GPA, you got a scholarship and cash for your living expense. So you can pay your dormitory, you can pay your transportation, you can pay your meal thing. And because it's government subsidized, you have a meal plan, so you can eat for free at certain point.

So I learned about that school. So kind around 1970, 1980, Korean government really want to make economy boom, and they realize that we need a science space [unintelligible 00:12:19]. So they really want to nurture the smart guys to be engineers. So that's the birth of that school. And I thought that is perfect for me because I don't have to worry about money once I study hard. But, of course, it's really, really hard to get [unintelligible 00:12:33]. So I told my mom and dad, "Mom, that school seems really good, and you don't have to worry about money. I don't have to have a student loan or anything." But it's not well-known until that time. Of course, nowadays, everybody knows KAIST. But when I was a high school student, it's really specialized, open to only a small group of the best math students. So general public doesn't know about that school at all. It's under the cover. And my mom and dad, "Oh, why don't you go to the Seoul National University?" Because everybody knows that school, like Harvard. And yeah, that seems also good, but that school's a generally good school, not for the best of the engineering. But I really want to go to the special engineering school. And good for the financial, also. And Mom and Dad, finally they said, "Oh, yeah. It's your choice. It's your life. You can feel free to pick."

And most biggest point is if you are smart enough, if you are evaluated—kind of qualified, you can go to the college right after second year of the high school, not after graduate. So you can save one year. And that is a huge benefit as a high school student because you don't like to go to high school. What kind of high school students they love to go to the high school? [laughs] They really want to be a college student because they're cool. And then KAIST—some KAIST recruiting people come to our school, and they kind of marketing about the school. You know what, if you're qualified, you can miss one year of high school. You can come to the KAIST. And then I was so fascinated with that. And I don't want to be locked in a prison like a dormitory in a boarding school.

All the boarding school students, they feel like they are prisoner inside of the dorm. And wow, I can be free. And that's so fascinating.

And I realize, okay, KAIST would be my dream school. I should go there. More interesting thing is, not because of the value of the school, but because only one year missing high school, that is not a good motivation. And even if my GPA and everything's good enough, I don't know why I [unintelligible 00:14:36] fail to get an admission. And then KAIST doesn't give me an admission. And then even my homeroom teacher, all the school teachers, feels so weird because we have a team of the students who is only kind of aimed to the KAIST. A hundred twenty students whole in my classmate, and around 90 students, they really want to go to the university around the whole nation. Thirty of them, they are aimed to the KAIST because their admission process is totally different from the other school and you should have essay question of the math and physics. You should write the three-page of the solution of [unintelligible 00:15:11] for solving the physics, even if you are a high school student. So you should have a totally different curriculum for that.

So I joined them, and that whole year of second year of my high school was to fight against that admission process. And I was average, a little bit higher than average, so there's no doubt to fail because every single science high school, they make almost 95% in that group of students getting admission from the KAIST. So some students behind me and they got an admission, but I'm the only person who got no admission at all, even if everybody [unintelligible 00:15:45]. My mom was shocked, and I also shocked. I cried for three days, and I feel like I'm total loser in my life, and oh my God, I failed. And as a teenager, once you fail one exam, you feel like you are a total loser. But as a teacher right now, it's nothing. But at the time it was the end of the world. But now I realize that why. Because my motivation was wrong. Yeah. I didn't want to study right. I just want to escape from the high school. And as a Christian, as a believer, that's the best choice God made for me. [laughs]

And I failed, and at that time, I have a really clear moment to think of what should I do next. Now there's no benefit as passing one year, and exactly same universities, they have the same value. So I research about the school most seriously. And then I got to an answer, good for me, because I'm good at math and science and I don't have a good financial status, although things I talk to—earlier, that was actually after the failing. I have a process of that. And then selected the KAIST again, and then my teacher—homeroom teacher told me, “Why the KAIST again? There's no benefit for you, Soyeon. Now you can go to the Seoul University because it's the same because—” It's a really interesting dynamics, also, because in Korea, as a senior homeroom teacher, it is your medal, how many of your school go to the Seoul National University, how many students go to the medical school, and he really wanted me to get in that rank. But I keep going—want to go into the KAIST. And he keep asking me, “Are you sure? Are you sure?” And

then I—maybe I can try and then I can try both because it's the same timeline and then maybe I can make a decision at the end. So I really tried both. I take the SAT for the Seoul National University. I take the [unintelligible 00:17:44] again for the KAIST. And finally I should make a time to pick the date because interviewing date is the same.

So I got [unintelligible 00:17:56] through the first stage and second stage, and so the last stage, so we have a final interview. But I think it is on purpose because a lot of students like me, they got both, too, on their hands. But if their interview days are different, and then they should make a choice at the end and the school has hectic moment to finding the next candidate, so they on purpose make same day, make us to choice. And then finally I choose the KAIST to go to the more serious engineering school. And my mom and dad, at the time they didn't feel like that, but after all the studying is done and then they feel like so love to have that. And my dad always complain about the huge tax of his salary, but he just kept—"Oh, my daughter get all the tax benefit from my tax I paid before." [laughs] And my brother also go to that place, and then some of my father's friends, they say, "You know what, Yi, you got all your tax back because your daughter and son all goes to the government-subsidized school." So yeah, that was a kind of interesting selection. Yeah.

GN: And when you reached KAIST, you studied mechanical engineering?

SY: Hm-hmm [affirmative].

GN: And what made you select mechanical engineering in particular?

SY: Yeah. When I applied to KAIST the first time, I choose industrial design, not mechanical engineering, because I love drawings and artworks and all the DIY things, I love it. And I believe I'm talented in drawing and designing. And I failed. And there's one of my best friends, still now, she also applied for an industrial design together with me, and we both failed. So I was not alone. She was the kind of best of best friends of mine because even we fail together. [laughs] And she applied industrial design again in a year, and in those—in year, we training together, study together, and then I keep compare my skill with her. And in the middle of the night and she just nodding and sleeping and wake up and drink something. So cool. Her design was incredible.

But her sleeping—I drew it again and again and again. My drawing is a totally duddy. It's not good at all. So I realize that it's not proportional to that [unintelligible 00:20:25]. You should have a special skill for that. So, wow, to go to the art school, maybe I should have a special skill. But I'm not that kind of person. Because whenever I compare with my friends, my drawing is always taking triple, fourth time more but quality's always worse. And she just—[makes sound effect]. So cool. And then—I better not go there. It cannot be my real job.

And then I was total kind of chaotic. What should I do next? I lose all my goals. And so I didn't choose any major at all when I applied for the high school—uh, KAIST. And in KAIST, there's a really good policy that if you really want to go to the engineering school, any engineering school, you don't have to pick the major. And once you got an admission, you take the basic course like calculus and physics and everything, and then you can think of it and you pick the major later. I think that is incredible things for the high school students because most of high school students doesn't know what the major it is. They just forced to pick it, and they cannot help to picking it without knowing it.

So I chose to be the group of the people who doesn't know what to do. [laughs] Even if my friends are going to the industrial designing department. A huge group. I was so surprised. More than—our whole classmate was around 500 or 600 at the time. But more than 300 was getting admission without picking the major. We studied together physics and math and everything. And then finally we have a due date. We should pick until that day. And I have no idea. So my action is I put the huge paper on my dorm room floor, and I list out all the department names, and then I eliminate least favorite things. So industrial designing, of course, I already missed the chance because—especially [art?] school, you should've start from the first. So miss it. And computer science, oh my God, I'm not good at computer at all. I'm still allergic with a computer, so eliminate. And what else? Yeah, and physics, of course, is too serious. [laughs] Not cool at all. Mathematics. I love math, but when I entered to the college, I realize that I love arithmetic, not the math. Math is much more complicated, and I cannot understand higher level of the math. So math's eliminated. So all the basic science eliminated because it doesn't look cool for me. And eliminate, eliminate, and then sometimes two department and compete each other. Okay, I better let you go, and then that one is better. So I just have some kind of tournament on the paper with them.

And then finally I have a final three. So civil engineering, mechanical engineering, and material science. Material science seems kind of general, more like than any other thing, and material science seems like more basic. So whatever engineering career you take, material science could help you to go there because whatever you want to build you should have material. So seems kind of safe for me. And civil engineering, mechanical engineering, why they survive until the end, because I love building something. I love hardware. So they survive until. And I cannot pick either one. And I call my mom and, "Mom, I have three finalists." [laughter] But you know what? My mom even never go to the high school. How can she help me? But she just have a feeling of the name. "So, Mom, I have a material science and mechanical engineering and civil engineering." But when my mom heard about civil engineering, and she just thinking about construction area. Because civil engineering is more like a construction site as a general public, even if civil engineering itself is really sexy. So Mom said, "Soyeon, you are a girl. I don't want you to have a helmet and have a kind of construction boots and fighting something. It

doesn't look good for you. And then I know you're a tomboy. You doesn't look like girls at all, but I don't want you to be the really, really guy." And she just eliminate civil engineering. So, "Oh, thank you, Mom." And I can say eliminate one.

And then finally I have material science and mechanical engineering. You know what, so stupid a choice. How many friends more in there, I just think about it. It's only one of my friends because, as I told you, I failed first admission, so a lot of my high school classmates, they are already in KAIST. And whole—my close friends already in KAIST. I just go one year late—later. And I checked how many of my friends in there. [laughs] And material science only one. Mechanical engineering, I have 10 of my friends in mechanical—oh, that's nice. Then they can help me.

And then even if I'm not that tall, even if I'm not that kind of athletics, but during my high school I was in a basketball team. As a manager, not a player, because I'm not good at play. But I love basketball and baseball. Cannot help it because I was a basketball team. I love baseball, men's. All of them are guys, and they all go to mechanical engineering. It doesn't have any problem at all. And then more than 90% of my friends, because of science high school—and then I played Taekwondo, so 99% of my friends are guys and males, and they love mechanical engineering more than the boring material science. So that's it. I just pick it. So it's not logical at all. It's not rational at all, but I just go there. But thank God that was most my favorite. So after graduate I feel like, oh my God, thank God. What if I was not the person who is good at mechanical engineering? Because my choice was not logical. But once I get in and study, I realize that I love it.

And I really appreciate my dad, also, because my dad was not good at the financial, taking care of the whole family, including me and my brother and sister and also my grandma, my mom's mother, lived together in a small, little house. So he should've take care of everything. So we don't have a plumber. We don't have any money to hire plumber, so my dad fix everything. And he fix all the boilers, all the electronics, and because I'm the eldest, I always help him because my mom and grandma taking care of the baby brother, kind of thing. At that time, I was trained as a mechanics, not mechanical engineer. And he was almost mechanics. I bet if he were born again around 2000, not 1940 in Korea, he would be an engineer. But to take care of the family, being a caller in a bank is the most stable job in Korea at the time. And he has several siblings, and his mom and dad was not that good at all. His mom passed away early time. His dad was alcoholic. So he was kind of like a person who take care of the whole family, cannot help to be a caller in a bank. But thank God, his gene and DNA come through me. And we fix my bicycle together, we fix our boiler together, and we helping each other to finding the solution. And even at the time, I didn't know that I love mechanical engineering, but after graduate undergrad, I realize, wow, that's the whole things come together and then [unintelligible 00:27:59] each other, and it make me mechanical engineer. So that was really incredible moment.

00:28:03

[Postgraduate studies]

GN: So then when you went on to start studying for your PhD, you shifted your focus.

SY: Yeah, right.

GN: And can you talk a little bit about that decision and—

SY: Yeah. So, oh my God, you make me feel so interesting because my life is a—all my life is kind of avoiding the hurdles. [laughs] Not the making something, but the avoiding the hurdle. So I went to the mechanical engineering department. And I love mechanical engineering, but I love building thing, making thing, but I don't like the mathematic simulation. I'm not good at imaginary number and then create a calculus equation. I realize that, oh my God, I love hardware simulation, but I don't like the software simulation to calculate everything. And what should I do? Because I really want to go to the graduate school. Fluid dynamics, all math, so eliminate. And solids dynamics and all the material things, around the 1990s, they always do the simulation with the computer. But as I already told you, I don't like the computer. I don't like the programming. So eliminate.

And have several lab in KAIST to survive is one of them is a micro machine lab. And then those micro machine lab, professor told me, like, you know, our students—because technology is still developing, so we have a really good tool [to] simulate all the macro stuff, but there's no good tool and simulation tool for the micro stuff. So if you really want to do micro machine, you always should make it first and all the things are more like empirical rather than a simulation. That's so fascinating to me. So, wow, then I don't have to—I don't have to do the programming. I don't have to do the math. I just want to build right away. That's really cool.

So I joined the micro machine lab and then go there. And at the time, we had kind of inkjet printer and an acceleration sensor in all the models, so it was a huge boom around the 2000. So one of the kind of popular lab in mechanical engineering because around the 2000, all the STEM's going down and boring math and science, physics going down. But micro machine looks really cool because Intel comes up at the time, IBM comes up, and then all the micro machines—semiconductor looks really shiny and sexy. Even if I'm not electrical engineering, but I could have been more closer to them. And then many of the mechanical engineering students, also, they don't want to look like an engine stuff. They don't want to be the kind of welding thing. So a lot of students doing the micro lab. It's a huge competing.

So to pick the two master students—there's 16 students applied. I was one of the only girls. And we should have an interview and that kind of thing. Luckily, he picked me. So he told me and warning me, like, "Soyeon, you know what? I've never had a female student. So I feel a little afraid. But there is no reason to cut you out, so I really want to try out with you." And then I joined the lab and all guys and then no women at all. They are not accustomed to working with women and kind of thing. But I'm okay and love it.

But at the end of my master's, huge bio kind of trend is coming up. There's a lot of engineering that combine with the bio things. So prosthetic things and kind of artificial legs and arms coming up and then AI comes up. And then my advisor said, "How about micro machine to go to the biological stuff?" Because micro machines are really good at kind of biology or medical diagnosis kind of thing. It looks cool. But I remember, I eliminate biology very at the first stage. [laughs] Oh, I'm not good at biology. But that was real interesting, also. It's not logical at all, but he, as our advisor, is kind of leader of the whole research group. He should have picked several students who go to the bio sector. And a whole 20 of the PhD students, master's students, and a little bit of the undergrad students, we are working together. I'm the only woman. He believes, like, maybe woman would be better at the biology. [laughs] It's more like a girl thing. And he asked me, "Why don't you go in biology part? I really want to have students who do the biology application from the micro machine." And I remember I don't like biology, but if I used mechanics to do biology, it looks like of cool.

So he picked me, and then I said yes. And then I really loved the multidisciplinary rather than a serious one. And from the PhD, I took all the basic undergrad course of biology as a PhD student and stuff from the scratch again. Because I don't want to kind of fight against my advisor. It's kind of avoiding hurdles. [laughs] So just take it. Okay. I can try. And then you know what? That was a huge luck because huge microbio [unintelligible 00:33:16] and mechanics that coming up around the 2000s, so wherever I go to the conference, everybody tried to listen to me. And then my papers and my research is always kind of very first. So good to have a job. And I have a plan to come to the U.S. to have a post-doc position. And that field is really fresh at the time, so, wow, that's cool. Even if my advisor push me over there, that looks really cool. So I love it. So right before apply for an astronaut, my trip was all set to there. Yeah.

00:33:48

[Astronaut application and selection process]

GN: And so what was the timing in terms of where you were in your PhD when the astronaut announcement came down? How did you hear about it?

SY: So my advisor recommended me go to the bio-medical track. And at the time, was the end of my master and a start with my PhD. And then my advisor really want to join the

newly developed department—bio system department in KAIST. It's a quite new department. So my advisor was the number one faculty in the new department. Huge grant comes in, and I could change my major there even if I have—still having same research. And around the third or fourth year of my PhD, I was total lost in my research because my research doesn't go further. So my experiment was failing, doesn't have good data at all. I really want to finish my PhD, but my experiment always going wrong. And I was total depressed. And then even I just—[unintelligible-00:34:54], "Soyeon, can you even graduate? Can you get a PhD? You better give up." And then I even think of, "Maybe you are not that smart enough to get a PhD." And then compared with my friends and lab mate, my research is always go bad. And then so tired.

And in the middle of that time, I do my PhD thesis—proposals and use up my grant and that kind of thing and depressed. And then I write down the resignation of the school—PhD program resignation and almost—I just think about give up. Because even if I got PhD, I don't think I deserve to have one because my research was not that good. And thinking about what else kind of job I can go there if I just withdraw this program and think about that.

But around that time, I read a newspaper articles: Korean government try to find first Korean astronaut, maybe next year. And they cannot kind of secure the budget yet, but they are struggling to find a budget to go there, blah, blah, blah. And, wow, that's interesting. I just ignore it. But those articles, it comes up again and again and again, and I'm—every day I'm doing the experiment. But they said first Korean astronaut doing the experiment in the space. And I'm tired of the experiment under the ground and in clean room, and what if I can do this experiment in space with the zero gravity? That would be really cool. It's really impulsively to think about it. And then come out of the clean room and told my friends, "Have you guys heard about the articles, the astronaut program?" They said, "Yeah, I heard about that. But maybe they cannot make it because budget was not secured." And then government always play with the media and then nobody trust it. And I also, "Yeah, maybe. But what if they will really start? I really love to apply." And then all my friends said, "Are you serious?" And, "Yeah. It would be really cool."

And then I'm kind of person I'm easily distracted by anything. [laughs] Whatever looks fun, whatever looks interesting, I always go there. So during my studying in the KAIST, I was a vocalist in a rock band and member of the choir. Sometimes I cut my friend's hair, got the money. I was a wedding singer as a part time. Yeah, I literally do wedding singer because they paid \$100 per one sing for the [unintelligible 00:37:27] singer. And that's a huge money for me during my college. And sometimes I made accessorial—the hairpins and sell it in open market. So astronaut program is kind of that. [laughs] So all my friends would say, "Oh, you can try it. Whatever." And they say it like that. And then once the program more serious and serious, they finally said that in two months we will open the application. And then my friends—some of my friends heard about my opinion. They just

come to me, “Soyeon, they open really application. Are you serious to apply?” And then I just said, “Why not? Just try out.” And then they gathering all the information for me because they don’t want to apply, but they really want to watch how it goes. [laughs]

GN: So you were the guinea pig?

SY: Yeah, I am in the guinea pig. And then one of my friends, especially guy friends, has a huge logic why I should apply. And in Korea, we have a military service, so any guy, you cannot avoid it if you are healthy enough, if you are kind of older than 19 years old, then you should pick the time where you should go in. Between the 20 and 30, at least you should spend two years for the military stuff if you should pick the time. And many of my male colleague, to avoid the military service, they joined the PhD program in KAIST. Because government has a super special subsidized program for the guys who is really good at the STEM, they can stay in the school as a military service. So they count their military clock inside of the school. So it’s the best of the guys. They don’t have to do the really boring shooting and then grueling kind of things. So more than 99% of the male colleagues, they pick the KAIST PhD program to avoid a military service. Of course they love STEM, but if they go out the university, they should go to military service first and then go. But KAIST is really harder to get an admission, but it’s a huge benefit.

So they said that, “You know what? We cannot stop our PhD program because I don’t want to go into the military service.” And some friends of mine, they already [unintelligible 00:39:35] of 20. They have wives and kids. And some guys, they cannot help—they cannot survive without a school program because they stick with the military thing. And then they said, “We cannot quit PhD program. But you are a woman. You don’t have any military program. You don’t have any kids to take care of. You don’t have any wives to buy anything. So you are the only person who can try something else.” [laughs]

And then one of my friends has a really good analogy, bring it to me. “Soyeon, you know what? In Korea nowadays, it’s so Westernized. So nowadays, Korea is really kind of interesting gender equity. So they would pick several women, not for the final, but for the final 100 or something, because they want to show the general—we are equal to everybody. But think about it. How many engineers could be the female?” And at the time, I run every night for the marathon, five, six kilo every night. And in the morning, I always went to the swimming pool, and I always tried to make my body healthy. I believe that is the most important things to be the right engineer because without healthy you cannot do anything. So they said, “You know what? Among the geeky, nerdy engineers and scientists, who can be healthier than you? But astronauts should be healthy. So I think you can survive at least until 300. So you would be the best candidate among us.” And then, oh, that’s really convincing.

So I applied, and all my friends so excited. And they even betting each other. Soyeon made 300. Soyeon cannot make 300. They put the \$10 on the board and fight against each other. So that was so fun. And then during that time, my feeling is, if my friends, if my peoples feel happy with this, it's worth it to try. So I apply. And then literally when I apply through the internet, all my friends behind me. [laughs] "Try it. Click this." That was so fun, yeah.

GN: So you applied and then as the selection process progressed, did you have to—

SY: A lot of things.

GN: What did you have to do as part of the selection process?

SY: So when I applied, I uploaded a resume and several essays and everything, and then from those essay and resume, they filtered around 5,000. Because 36,000 people applied, but some of them is not that serious. They just apply. And they checked the resume, they check everything, and then they cut the—almost of the 30,000 people cut out. And then around 5,000, 6,000, we started real race from that. And then medical check-up really quick—like an annual medical check-up. So if you are diabetic or some serious liver thing—problem or kind of thing, and then you will be eliminated, even—you don't [unintelligible 00:42:32] to try more. So they just eliminated. And also written exam. English, common sense of science, and Korean history. So I just wonder why Korean history, but they really knew that once first Korean astronaut was selected, they should be the representative of the whole Korea, so should understand Korean culture and history very well. That makes sense.

But that is my weakest point because I'm not good at history. I'm not good at literature things. So when I go to the written exam place, all my friends, "Oh, you go there." And then my friends said, "If you are eliminated from this stage because of the Korean history, because English—" My English was not that good at that time, but I believe my English was better than average of Korean people, so it would not be that huge problem. Science and math, of course, that is my job, so it doesn't have any problem. But Korean history is a huge problem of me. I still remember my SAT test in my high school, my history point was much lower than the whole science high school—not science high school—whole Korean high school's average below. So mine was really bad. So my friends was worried about that.

And then finally I survived from written exam, and all my friends said, "Soyeon, then you can make 100 because Korean history was the biggest hurdle for you." [laughs] Yeah, so at the time I became a 300. And then from the 300, we have kind of physical test, so running and kind of squat and sit-up. They have some lower bar to make it up that once you pass, you just pass and kind of thing. And then in-person interview with a committee. They just ask me why I want to be an astronaut and then they ask a lot of life

example things and what is your biggest problem in your life, blah, blah, blah. So those things.

So, yeah, finally I made 100, and from the 100 we do another test and interview and making 30. And from the 30, we stayed in a hospital for whole week to check the—from the head to toe. So they check all the MRI thing and several kind of bottle of the blood they took out and then announces everything. And brain things and mental—psychology consulting and some kind of breathing and then running on the treadmill, and then they inject some kind of—I don't know what it is, but they inject something, and then they try us out to the run and then how far we can run, kind of thing. So a lot of tests.

And even around that time, I feel so happy because they cannot find any problem with me. [laughs] And then some of newspaper articles said that, “You know what? To pick the Korean astronaut, 30 of the finalists, they went to the hospital, they spend a whole week to test, and then it cost around \$10,000 medical check-up.” Wow. I get the \$10,000 medical check-up for free. So, wow, it's a huge deal. You know what, if it comes to the U.S., it would be the \$100,000 thing, because Korean is—basically medical cost is really cheap. So \$100,000 is huge—\$10,000 is huge. So I call my mom. “Mom, Mom, Mom, I test the medical things and it's a \$10,000 cost. How can I get this? And then they told me I don't have any problem.” And my mom said, “Oh, that's good.” And that was a real interesting thing, also.

And then some of the people, they have kind of separate consult with the doctor and then they said, “You know what, you have this disease. It's not the problem at all for your [unintelligible 00:46:24] life, but that could be the problem if you fly in space.” So some people eliminated with that. And then some people, even they just called and then go there, they said, “You know what, it's not a problem if not only live a normal live but also even fly to space, but you have this defect on your heart or this defect on your stomach.” So we have five people stay together in same room. And then every night they called. They are called and then talk to the doctor—a specialist kind of thing. So nobody called me. So I just wonder why nobody called me. Nobody interested in me at all? Maybe I will be eliminated.

So almost end of the medical check-up, I knocked the door of our chief surgeon. And he just surprised. “Why you knock the door?” “I really want to meet you.” And he said, “Why?” “Because everybody was called at least one time or two time, but nobody called me.” So he said, “What's your name?” “And my name is this.” And he checked everything. “You know what? I have never seen this kind of person before, but you don't have any defect at all in your body.” And, “Really?” And he said, “That's because we've never called you.” Wow. So even if I will not be an astronaut, that's a huge outcome of the astronaut selection.

And then in same time—[laughs]. It's really embarrassing. In Korea, we have a stereotype of the woman. So kind of dream woman to date or dream woman to be wife. And it's kind of—most of the guys has the same dream woman. It's a thin, pale, white skin, and little bit weak, doesn't have any muscle at all, and emotional. But once I prove that I don't have any defect, I have enough muscle, so I'm not a kind of dream woman at all. And so I called my friends, "You know what? I knocked the door to the chief surgeon. He told me I don't have any defect at all." And he said that, "So you prove you are not the dream woman anymore." Yeah. Unfortunately. But I cannot tell anybody. This my secret. [laughs] So, yeah.

So during the selection process, I don't care if I will be a final or not. Every single step I find my own meaning. I find my own happiness. So that was really incredible process I've ever take.

GN: And was this all handled within the Korean government?

SY: Yeah.

GN: Or were there representatives from NASA or Roscosmos?

SY: In Korean government. But they basically researched about NASA astronaut selection process and Russian astronaut selection process. And then we had a several kind of board member and committee from the Russia because Korean government already made a contract with the Russian government to send the astronaut through the Russian program. And then they start the selection process. So as I remember, several times Russian kind of representative delegation came and checked it out, and they reviewed the selection process, and then we asked them kind of advice for them. But around that time, I was not in the loop. I was the candidate. So I couldn't see inside at all.

00:49:28

[Selected as a finalist and balancing astronaut training and PhD work]

GN: Got you. And so ultimately you were selected as one of two finalists, correct?

SY: Hm-hmm [affirmative].

GN: And so what came next for you?

SY: They said we would employed by the KARI—Korean space agency kind of thing—because they can dispatch their employee to the Roscosmos Russian space agency. So even my PhD was not over yet, I should get a job. And that was a huge hurdle also because I cannot be sure, how can I handle my PhD program? Because it is never happened before, not only in KAIST but also KARI. They've never employed kind of active students before. Always they kind of recruiting the graduate or graduate to-be. And

KAIST also, they've never making the active students who've never had any PhD finishing plan at all, doesn't have any plan to have my thesis defense. So it's huge kind of chaotic.

And then not only KARI, but also KAIST, they—"We don't know. Let us think. Let us think about it." And my worst case scenario is I should give up either one. So that was really hard. And finally, we find a way as maintaining my student status in KAIST, I can be employed by the KARI. So finally I made it. But KARI wanted me to spend whole 24/7 to be an astronaut rather than spending time to be a student. And huge debating over that. And I went to the—my advisor and then told him, "I think I cannot keep studying and research, so how about I can have leave of absence or hold my PhD program? And I should go to the Russia, and in a year come back, I can keep continuing that." Because school you can hold it. Yeah. If you don't pay the tuition, if you hold it, then you can just extend. So I'm thinking about that. And then my advisor said that, "You know what? You are researching kind of high-tech. It's really time-sensitive thing. If you delay one year, if other people publish exactly same thing, and then you cannot defend your PhD. You cannot publish your journal at all. So you should keep in mind. So when you hold, it's not exactly hold. Maybe you should give up even if you don't want to do that."

Oh, okay. Then what should I do? And then everybody watching me as an astronaut candidate. And my mom even told me, "Soyeon, if you feel so scared to go to the Russia, you should just give up and don't have to feel pressured by the other people." Because huge peer pressure around me. But you know what? I don't have any scared feeling to go to the Russia to go to the space, but I feel kind of afraid to give up either one. That's the huge deal. And, "Mom, don't worry about it. I don't feel scared at all with any spaceflight or going to the Russia, but my huge kind of problems are PhD." And then my advisor said that, "Soyeon, there's nothing impossible. You can do it together." "Are you sure?" And he said, "Yeah. If you really want to do it, you can do it together. So bring your old thesis, all the data and everything, because you already finish all your experiment. So data analysis, any additional tests, we can help with here. And whenever you call us and then we can do it for you and then you have a lot of your lab mates who willing to help you. So you keep doing that." So, "Okay, I will try." So I bring all my PhD materials to go to the Russia. And during the daytime I'd take the training. At nighttime, I'd just writing my thesis and then data analysis. So I have two job in Russia. It was really hard.

GN: So as someone who spent your education trying to avoid hurdles, all of a sudden you're doing a PhD and training to be an astronaut?

SY: Yeah, yeah, right. So—yeah. So still, some people—a lot of the people ask me, "How can you do it together? Because most of the people, take only one is really hard for them for 24/7, but you just do the huge things together." And I can tell them, "I could do that only

because I didn't know how hard it is. If I know how hard it is, maybe I even cannot try it." But I can't help it. I just try it, and finally I made it. So you know what, I finally became a backup crew at the very first time. So my thought is [unintelligible 00:54:05] there because I spend some of my time to finish my PhD. I didn't devote myself to—wholly to the astronaut. Maybe my colleague would think about only astronaut things because he just resigned from the Samsung and he just employed by the KARI only, so he doesn't have to do anything except astronaut training. But I have huge other things behind me. So I thought, well, that's fair.

But in same time, thinking about the selection process, my advisor doesn't like me to apply for an astronaut. He think it's a huge distraction. And I also thought so because I grew up in Korea. All the Korean people think you should focus on only one thing. You better not distracted. But during the selection process, I realized that what is the real regiment, what is the real synergy? Because once I apply for an astronaut and I survive 5,000—I told you I was so depressed because my research was going wrong, and I keep telling myself, "Soyeon, you are a loser. Soyeon, you are most stupid people in the world because you cannot go through this. You cannot solve this problem." So I keep making myself negative. But I apply for an astronaut. I survive. I realize, oh my God, you can do it. You survive 5,000, and you survive 300. And then I have my positive energy back. And then those positive energy make my research better. If you go to the lab, "Oh, today maybe I would fail again," then you never, ever succeed. But once I survive 300 and all my friends, "Oh my gosh, Soyeon, you're 300," and then come to the lab and start my experiment, I was a huge cheered and positive. My experiment's going really, really well. So before astronaut program I spend almost 18 hours in lab, but depressed. But after selection process, I spend only three, five hours in the lab, but fully positive. That has much better results than the other one.

And then all the astronaut selection process was going during the weekend because most of the astronaut candidate and applicant, they have their own full time job, so they only came make a time during the weekend. Only in the PhD program, end of the Friday, I just, "Oh, I can do it tomorrow, Saturday." So I just give up. But once I'm in the astronaut program, I can't have time on Saturday because I should go to selection process. "Soyeon, you should finish it tonight." And then it became much better than before. So in same time, in astronaut training in Russia, during the daytime, I was so excited to learn something new and I'm so excited to be the first Korean astronaut would be or could be. And everything's just so exciting. And fully positive energy, come back home, I know I should finish this tonight and then do it. So those two jobs are synergy each other and make myself more positive. That's the only kind of reason I can make it. Yeah.

GN: And so what was the training process like once you began training? You went to Russia. Were you in Star City?

SY: Hm-hmm [affirmative]. So it was the whole-year program and kind of first half is the most like the classroom thing, so I should learn all the systems and safety and mechanism and theory. And half of classroom time is learning the Russian language because we should be the official Russian crew. So Russian language is a huge thing to be a Russian astronaut. So half-day is Russian language, half-day is technical stuff. And after those six months, we speak Russian good enough and then we start simulating thing. So inside of the simulator, we do all of the simulating things again and again and again until—even if you memorize it, you always should hold the manual to double-check and triple-check. So yeah, that is the whole-year thing. Yeah. And then during the summer, we should have a sea survival. During the winter, we should have a mountain survival. And those are things always inside of the—your schedule. So it's quite mixed.

00:58:21

[Selected as backup crewmember, training in Russia, and PhD dissertation]

GN: And you were originally selected as the backup crewperson?

SY: Yeah. After six months, Korean government said that we will pick the backup and primary. And after six months they picked me as a backup and then pick him as a primary. And I love it because even if I became a backup, they said I should stay until the launch day because we don't know what happen. So that is the biggest part because when I was in the selection process, whenever you're eliminated, you should go back. But in the primary and backup, even if you are backup, you keep doing the training.

And then when I went to the Russia, I just already knew that I would be a backup. In the male-dominant society, Korea, they would not pick the woman. And regardless of being primary or a backup—I think flight is only 11 days, but training is a whole year. So this part is kind of more fun and exciting. So if I can take this, 11 days, maybe he can take it. And almost end of the training, I realized that once you became a primary, all Korean people recognize you and a huge burden and everybody watching you. So I realized, oh my God, that's so stressful. And whatever small mistake you make, everybody talk about it, right? But as a backup, nobody knows me and nobody cares about me, so I can do whatever I want. So one day one of the journalists asked me, "Soyeon, how do you feel to be a backup? Because you cannot fly. You know that." And I said, "You know what? If the primary can get a fame, I can get a freedom." [laughs] He cannot get a freedom at all at the time. So, yeah, I like that.

GN: And were you in Russia the whole time, for that whole year?

SY: The whole time.

GN: So you didn't—

SY: Only two weeks' vacation.

GN: Okay, okay.

SY: Because I'm an employee, so we should have a paid vacation. So in the middle of the training, we had a two-week vacation and then coming back home. But even two-week vacation, but from the training in Russia, but one week is not really vacation because all the experiment was designed by the Korean scientist. So those one week was that they trained us how to handle experiment in space. So we have off from the Russia two weeks, but one week is a training with the Korean scientist. And another one week was the real vacation, but during that time I have a PhD thesis final defense, so those—the whole week, I cannot sleep at all because I should make slide decks and meeting the committee and presentation kind of training and practicing and—yeah. It was not vacation for me.

GN: But did you successfully defend your PhD in the middle—

SY: Yeah, yeah. That was real interesting. One of my committee was in U.S., and my advisor was on sabbatical break in Vietnam, and then other three professor was in KAIST. So even if I made Korea for two weeks, I cannot be sure if the whole committee come in the same place to have my PhD thesis. Because most of time PhD students follow the professor's schedule. But in that time, I only have a two-weeks window and then only one-weeks window.

But luckily, the professor who was in U.S., he had his own vacation to visit his family in Korea. He could take that week, even if I didn't mean to. And my advisor had some medical problems and come back to Korea to go to the hospital. And then other committee, so we picked the only one day, only two-hour slot, everybody come in and we made it. And then finally my advisor has not that good shape, so he should stay in the hospital, so he has it televised with my presentation. And then he signed on the hospital. It was real interesting. So all my friends said that, "Oh my gosh, Soyeon, your life is almost like a sitcom thing." [laughs] "Even if we try to make on purpose like that, it doesn't happen. But your life is really sitcom." But it was more funnier thing is one of my friends keep telling me, "Soyeon, your life is almost like a sitcom. It's so funny." But once I became a primary, and he come, "Soyeon, I think your life is a sitcom. Finally it became a documentary." [laughs] So it was so funny. Yeah.

01:02:45

[Transition to primary crew]

GN: So what happened with the transition from backup to primary?

SY: There's some kind of cultural misunderstanding thing also, because until that time, Russian space program is under the military program. So all the training, all the processes

are really serious under the military culture. And thank God I had experience with working with a foreign country when I was in PhD program, because my whole PhD program was the collaboration with us with UC Berkeley. So we have kind of sensitive patent issue always between two school and always between two country have a huge patent issue between, too. So whenever we have a collaborative research together, we should figure out which kind of IP should kind of belong to the KAIST in Korea, which IP belong to the Berkeley in America. So we have a lot of the security issues. We sometimes should meet the intelligent agency in between, too. So I had a little bit of the experience of the diplomatic security issue going through that as a researcher.

And when we went to the Russia to have a training, you know, our space program—space technology is really, really sensitive security issue between the country. So if you go to the NASA as a researcher, even if just duct tape on the bottom, but by the contract you better not touch that duct tape kind of thing. It's really stupid, official process. In Russia, also. And we know which is the casual, which is not that sensitive, which is really sensitive, so we always just override the security contract. Sometimes it's really stupid. But at certain point, if the general—kind of huge general related or military policies related, we at least pretend to follow the protocol, even if it's stupid. As a military guy who living in that place, you know easily you could [unintelligible 01:04:49] that, but as a foreigner, sometimes we couldn't sense that and then we could make a huge mistake.

So my colleague, he couldn't sense that. And then sometimes he'd take the material, get out of the simulator. It's not sensitive at all, but some military police come to our—is classified as confidential information. How can you bring this out of the simulator? But if you read it, it's so stupid. It's already on the Wikipedia. But as a protocol. So he made those kind of mistake. And then my case is always, “Oh, sorry. I didn't know that,” and then put it back. Because I was already minority there. No women, no Asians, small, little. So I always should be careful not to make other people upset. Because they don't have universal standard. Sometimes they are more cruel to the women. They are more generous to the muscly guy. So I already had those experience from the mechanical engineering department, so I always try to be careful. But my colleague, he's the Seoul National University alumni working in the Samsung. So he was more like a major—not a minor, really. Major, really, he always. So he accustomed to act like that. So even Russian military, he just act like he's not the minority and then that makes Russian military feel a little uncomfortable. Oh, small, little Korean is—you really think you are military—Russia military? You not.

And then some kind of conflict happened, and some Russians feels a little more uncomfortable with that. And they suggest to Korean government, “It's okay. We know that it's not as sensitive, but what if when he was in space he didn't listen to us? What if he's too brave during the space? Then it would have a huge problem. And then he doesn't have experience in space. He's a kind of rookie. Then those rookie doesn't know which is

really important, which is not, and those little, small mistake make a huge consequence, then Korean government, can you be liable for all those things?” And Korean government feel a little afraid.

And Russian government—Russian kind of colleague of mine realize that I’m kind of too careful. But that is from my gut because I was forever minority. When I was a kid, we are living in a poor bracket area. So I’m always should be careful not to cross the border between the higher class of peoples. And science high school, woman minority. Mechanical engineering department, of course. And when I was in PhD program, whenever we have a collaboration with a company or a government, I really knew that some guys treat me almost nothing, only because I’m a woman. And whenever I pick the phone, say hello, they just said, “I would love to talk with the researcher who in charge of this research.” And then I said, “Yeah, I’m that person. I’m Soyeon.” And they said, “Oh, you are the person? I would love to talk to the male researcher.” And then, “Okay,” transfer. So all those are things I already have, so I should be super careful.

So they just kind of think of me like always follow their rules and kind of lower attitude. And, of course, I did my best, and then some of the Russian colleagues, they realize that even under those kind of discrimination, I just do my best to break it out and make it happen. And then even in the middle of the simulation training, some instructor told me, like, “Soyeon, you don’t have to learn this. Even if they—” He literally told me, “Even if you will fly, some male colleagues help you to do that. So you don’t have to learn to do it.” And then I told him, “You know what? I’m not here as a woman. I’m here as an astronaut. I really want to try this. If you don’t want me to try, of course, I can step back, but I really want to try. So don’t worry about me.” And he just said, “Ah, because it’s dangerous, because it’s—require force.” No, just a lever. It’s not force at all. But he told me, “You need force.” I don’t think so.

So all those things happen, and then some 30 person observing me, some other peoples observing me, and then they realize that I’m kind of good at mitigate those kind of conflict. So those two voice come together, and then they recommend me more than him. And then first time Korean government said, “No, because we want to make him fly.” But after two, three times of suggesting from the Russian side and then Korean government said, “Maybe we would accept your suggestion,” and then finally change it. So it’s not a big, huge scandal. It’s more like a cultural misunderstanding. And I feel so thankful because, when I get through all those discrimination and minority issue in Korea and as a woman, I really hate it, but when I got through those older things in Russian, oh my God, that is the wonderful opportunity to learn how to mitigate, how to handle that. So yeah, in life, no matter how bad of things happen, it always give you a chance to learn. So yeah. And I don’t know what happened in the deep side because I’m also training and then I’m not the person who made a decision. But as far as I know, it was starting from the cultural misunderstanding.

- GN: And just do a quick time check. Do you need a break at all or...?
- SY: Just a sip water. That's good.
- GN: Okay. We're still good. We're still good. And are you okay to go past 7:00 if necessary or—because we're at 6:30 now.
- SY: Oh, yeah, yeah. I'm good. Yeah, until 7:00 I think I'm good. Yeah.
- GN: Okay. So you have now been moved to the prime crew. How long before the mission was supposed to fly was this?
- SY: Two—kind of—a little bit less than a month.
- GN: Oh, wow.
- SY: Yeah, it's really close. Because three weeks before, we should fly to the Kazakhstan. So right after changing, I should fly to the Kazakhstan. So a little bit less than a month. Yeah.
- GN: And were you training with both the crew that you launched with as well as the crew that you would land with when you were training?
- SY: Yeah, but most of time with crew with I launch with. Because landing, they already in space during my training. Because they stayed for six month. Yeah.
- GN: And once you were promoted to the prime crew, did you—it was very soon before launch. Did you immediately get additional pressure from the Korean press?
- SY: Yeah, hm-hmm [affirmative]. Because changing itself is a huge scandal. And even—not only Korean media, but also international media. They are so interested in why change it. And then all the global society knew that Korea is a male-dominant society. How can they make a woman fly at the very first time in history? So even more interest coming in and then more exposing coming in. So that's kind of tricky for me. Yeah.
- GN: And so what—the Korean government booked the flight similar to how Space Adventures would book a flight with the Russians for spaceflight participants.
- SY: Yeah, so that is interesting. It is the kind of transition time to get the Space Adventure in Russia. So Russia originally first. They have a government-to-government contract to fly the—any country's first astronaut. But they realize it's a huge diplomatic problem. So they try out Space Adventure thing. So my flight was almost right before the transitioning from the Russian government contract to the Space Adventure contract. Yeah. So it is quite similar, but a little different because government-to-government contracts are governmental, diplomatic, huge issue, but Space Adventure thing is a commercial. So it

doesn't matter citizenship it is. It doesn't matter all the things. And is kind of just business contract. So little bit of different.

GN: Got you. And did you—what was the—you've spoken a little bit about the sort of gender issues, but in terms of other dynamics with the crew that you were working with, did they see you as a fellow member of the crew or were you seen as a passenger? What was the—

SY: Yeah, that is a quite interesting dynamic. Especially the crew who had training with me, they just treat me exactly same as other astronaut trainee and other astronaut candidate. But among the instructor or government officials, they would might have a different point of view and—but at least the person who had training together and getting through the hard time together and then they treat me exactly like that. And also, even NASA. And then NASA officially, they just treat the—all the astronaut like me because we didn't go through NASA and we were not American—Russian citizen, so they just called us a flight participant. But American astronaut who had to train with me, they introduced me to any other people, “She's the first Korean astronaut. She's the kind of cosmonaut from Korea.” So there is a different kind of point of view.

GN: And did you do any training in the United States?

SY: Yeah, for a week. Because space station, some part belong to American side. I should have at least bare-minimum safety issue about that. So I should come to the Houston as a Russian crew and then take a safety training inside of the International Space Station mock-up.

GN: And who were your crewmates for the launch?

SY: Sergey Volkov and Oleg Kononenko. And yeah, we didn't have a training during the training time because once you passed the sixth month or seventh month, you're training with your own crew. So primary crew training with the primary crew. I was a backup, so I training with my backup crew. They will fly six months later. So I couldn't have enough time to kind of interact with them. So that was the biggest hurdle for me when I changed to primary crew. But luckily, they are really nice guy, and then they are really open-minded, and they accept me as one of the crew right after changing. And then luckily I was a good friend of the [unintelligible 01:15:40]'s wife and then their kids loved me. So those kind of things helped me to be more closer even before being a primary crew. So that was really wonderful.

01:15:49

[Launch day]

GN: Got you. So talk a little bit about launch day. You had some interesting experiences on launch day with the—

SY: Yeah, right. So first of all, I couldn't feel any difference. Because it is launch day, but physical things happening is nothing different. So wake up as usual and the doctor check me as usual, but everybody just take care of me as almost like a king because we are ready for launch. And taking a ride and right up to arriving the launch site. Valentina Tereshkova surprisingly comes up. She just coming in as a surprising, and then she held my arms and taking me to the launch pad. And it—that was really incredible moment.

And on the way to the launch pad, I really want to follow the Yuri Gagarin's tradition, pee on the tire thing, but because I'm a woman I cannot pee on the tire in public. [laughs] So I just prepare for a little small water bottle, and then at least I want to pretend to pee on the tire. But nobody want me to do that because it is a diplomatic problems. So you know what, once you checked all the spacesuit and then all the security check, all the safety checks, and you are ready to fly, so officially you shouldn't take out of the bus. You should get to the launch pad right away. But only because Yuri Gagarin did, unofficially, secretly—everybody know that secret, that secretly buses stop in the middle of the Kazakhstan plain and then astronauts getting out of the bus, they opened all the zipper and then pee on the tire, close. Means you should check the safety again because open and close. So you better not. And then officially they should not but cannot help it because Gagarin did. But they okay with Russian astronaut because liability on the Russian side. But Korean astronaut is a different issue because if I have a problem, all the Russian program should take the liability of my thing, also.

So one Russian general told me, "I know you really want to do that, but because you're a Korean and we have a huge diplomatic problem—what if you fell down and what if some dust coming in your suit and then there is a huge problem? So we cannot let you get out." And then I was almost fighting over that. "I really go out," and "I know a way," and—but I don't want to make a huge diplomatic problem because what if I punch the Russian military as a Korean citizen? So we just smile at each other and I understand, but I feel upset. And then because he told me, "Because you are a woman, you cannot get out of that," and that—it is sort of uncomfortable, but I knew that—he's almost like my father because he's a former astronaut. And he treat me like a little girl, so—not because I'm a woman woman thing, but because he treat me almost like his little baby. So I try to accept it and then cannot get out of the bus.

But once I arrived at launch pad, there was Tereshkova and then I forgot all those bad memory and excited with Tereshkova. And then she take me to the launch pad and then she act exactly like my grandma and then she just, "Soyeon, everything will be good,"

and then, “Don’t worry about it.” And I didn’t worry about anything. But she was so worried about me because I am almost age of her granddaughter. So all the moms are same. Now I can understand. Most of the moms and grandma, they are okay to handle the tough things by themselves, but they don’t want their kids to take care of that. So even if moms cut her own hands during the cooking, it’s okay. But if their kids has a plastic knife and it just scratch it, they feel so upset with that. So, “Careful. Don’t do that.” So at that time, Tereshkova also exactly act like that. She flew when she was 26 years old, even younger than me. And at that time, her flight is more dangerous because it is early stage. My flight was so safe because mostly reliable space shuttle and space vehicle in the world. But she just feel so afraid to letting me inside of the capsule. So I feel huge heart of her. So that was an incredible moment.

And then getting inside of the launch pad and then inside of the service vehicle and all the peoples coming in and help us to strap in and then checking all the safety things. [unintelligible 01:20:27] go really well. Everythings go really well. But as I told you, we should suit check again and again and again. So maybe at least two or three times, double-check before launch after getting inside of the Soyuz. And then first check was going really well, but at some point my commander’s suit was bust up because his zipper was not secured well and it—when oxygen pressure was to go up and then zipper cannot hold it and then bust up, and then he cannot move his arms at all because suit is kind of bust up. So Russian spacesuit is kind of like a huge pocket like this. [demonstrates] And then you hold it and then twice and then getting in and then zipper comes like that because you should get in the spacesuit. And we were so afraid because if the spacesuit failed, we cannot fly at all.

So my and Oleg’s suit was totally okay, but Sergey’s suit is a burst. And then we kind of report to the mission control, and then they said that we cannot be sure if we can fly or not. Definitely we cannot fly because he—his suit is like that. [demonstrates] And then turn up the radio and then they said they will discuss about that. And then we tried to do something by ourselves because once we get out of the capsule, we don’t know when we can fly again. So we find emergency toolkit and then find a thread and rope, and then we kind of roped around Sergey to knot the bust-up and then tied it. And then we checked the pressure test ourselves two times and three times. Does it any leaking? Does it any pressure thing and then does any suit bust up? And then we realized that he’s free to move because rope is hold it.

And then once the mission control coming in and then, “How about you guys try to suit check again if it is a bust-up or not?” And then we said that it’s not bust-up. And, “Why? Because zipper is a fail.” “Because we tied him.” [laughter] And then, “Okay, then does it—did you guys check the oxygen leakage or any pressure leak?” And then we said, “We triple times checked and then oxygen leaks at all and then doesn’t have any pressure leak at all.” And they said, “You guys already did inside?” “Yeah, yeah, because we really

want to go.” And then we tried, and they said, “Then you guys should pressure-check again in front of us.” Because there’s a camera and that kind of thing. And then we showed them his suit is good enough to fly up. And they said we should check it out again and we should talk with head of the Roscosmos and all the technical guys, because even if we are okay but they don’t think that it’s okay, then we cannot fly. So they just talk, talk, talk. It takes 20, 30 minutes. It feels like forever because we really want to fly. And they said, “Okay, it’s good to go. But when Sergey coming down, you should get the new suit, so we will send a new suit for you through the progress capsule.” And then thank God, we all can fly.

So that was really incredible moment because Oleg, he was supposed to fly 10 years ago by Shuttle. He had a training in Houston. But around that time, *Columbia* or something happened, and then NASA announced that no foreigners fly through the Shuttle anymore. And so Oleg should come back to Russia, he should training with Soyuz all the way from the first, so he should wait another 10 years to assign for the flight. And Sergey, he’s supposed to fly around six or seven years ago, also. And he was a third crew member or something like that and he was in line, but around that time Perestroika happened, so all the budgets and all the Russia collapsed. So they should cut all the budget. So during that time, instead of the three, only two astronaut go up to the *Mir* because two enough to maintain the *Mir*. So he was cut. And he should training from the ISS all the way first. I was a backup, so supposed not to fly, finally became a primary. So three of us has a story. But his suit was bust-up.

So we said, “Maybe we are not the person who fly. Maybe we are meant to be not to fly.” And then—but we cannot take it as a fate. So we just rope him well and then make it happen. So finally we fly. And then when we had the launch, we have a huge shaking and then G, but we were so excited. Yeah, we fly! And around those time, Russian space program never, ever fly all three a rookie. They always have one person who fly before and two others are rookie or two peoples who flew before and one person’s a rookie. But Oleg has a history with training, Sergey has a history with training, so we were in recent five years or recent 10 years of first the three all rookie fly, actually.

GN: Oh, wow.

SY: So all three of us doesn’t know what happen. [laughs] And then all three of us, everything’s new to us and, “Wow, it’s floating! We are flying!” So yeah, we all three became a really close friends each other because we all have a same kind of hard time. So yeah, we still keep in touch each other. And then it’s really wonderful moment.

01:25:48

[Arriving at the International Space Station]

GN: Great, great. And so how long did it take from launch to catch-up with ISS at that time?

SY: Until getting to the orbit, it only takes 10 minute. So you get to the orbit.

GN: Right.

SY: Yeah. And then having around 20 orbit or something, and then we have a lander view. And then two or three orbit, and then finally we just touch each other and then catch-up. So it takes almost two days to touch the ISS from the launch.

GN: Got you. And once you docked with ISS and you open the hatch, what was your first impression of the space station going in?

SY: You know what, we are so tired of the waiting. So I can tell you, whenever you take an airplane to go to the China or New York, it takes almost 10 hours. So you wait 10 hours, really kind of good kid. But right after landing and then taxiing to the gate and the right before then gate, flight attendant said that everybody should sit down, don't stand up, and be careful until the airplane is really getting to the gate. But you cannot wait. Oh my God, I should get up. I should get out of the airplane. Even if you waited 10 hours. We are same. We waited two days and finally docked. And mechanically we are combined, but there is a pressure difference between the ISS and Soyuz, so we should have pressure balance at each other. It takes 30, 40 minute. We cannot wait this. Because we see the bars going in like downloading. The bars going in and testing going on and then pressure going on, and oh my God, we want to get inside ISS. So doesn't have any feeling—"Yeah, ISS!" [laughs]

And other three crew members waiting for us, they holding the camera. And I already heard it from mission control, "Soyeon, whole Korean nation watching you." That TV is a televised live TV show to the Korea, so I should wave to the Korean public, to the camera. So I should keep in mind what else the kind of TV things happen, media things happen, and as a representative of Korea, I should talk to the Russian TV and Korean TV. So all those things right after coming up. So I don't have any time to be emotional. My job was started right away.

GN: But you're being asked to smile and wave at the end of a two—you know, the equivalent of a two-day flight.

SY: Yeah, yeah, right. You should smile and then—especially this camera and wave. Because we are all so tired. Motion sickness and two days inside of a capsule, so my hair is a crazy messy. And then I throw up every 10 minutes, and then all my vomit plastic bag is on my side pocket. So there's no reason to smile at all, but I just smile. [waves] "I'm so happy to be here!"

01:28:50

[ISS experiments and experiences]

GN: And so once you're on station, what responsibilities did you have while you were—

SY: First of all, I should have 18 different kinds of experiment, and then 14 is from the professional researcher and then four—five is from the science textbook from Korea. So that is the main mission for me. So every day, I have more than eight hours to take care of the space experiment. And by the side is some Korean culture activity and TV interview, radio interview and some kind of regular crew activity, cleaning and arranging, finding the cargo thing. So 11 days was crazy busy, actually.

GN: And what disciplines were the experiments in? Were they—

SY: Every single. Because it's the first Korea experiment, so we should fill for the whole field. So one biology, one chemistry, physics, electric engineering, civils and astrophysics. And all different disciplines are coming in, and then we should pick fairly to every single thing. So I should be the multi-player. I should be the kind of multi-disciplinary. But thank God my background itself is a mechanical, biology, material science, and electrical engineering to make my PhD. So that background, even if I didn't mean to, but it helps a lot because I have a little bit of the electrical engineering to make my machines happen and a little bit of the biology because my PhD was the biomedical micro machine. And, of course, material science because I should have a material to have my own [unintelligible 01:30:27] micro machine. And so all of this little bit of I learned before, so it's easy to communicate with person who designed experiment.

GN: And in addition to Sergey and Oleg, who were your crewmates while you were on the station?

SY: Oh, Yuri Malenchenko. He was already up there for six months before me. And Peggy Whitson. She was—she went to Yuri Malenchenko together. So Yuri and Peggy was already six months over there. And Garrett Reisman. He was up there by the Shuttle because, until that time, Shuttle was not retired yet. So Garrett was around there a month or more. So we were six of us.

GN: Okay. And what was your favorite thing about being on station? What did you enjoy the most?

SY: Well, most of time is—of course, all astronauts the same—looking down to the Earth. Especially around Southeast Asia, I could see the typhoon forming and some thunder coming up from the cloud to the space because it's around April and so springtime. And Korean Peninsula, of course, is really small and short, but I love to look down to my own country. And during the nighttime, look up to the night sky. It's beautiful because we

don't have any diffraction at all, so all the—every single star has a different color. It's not the yellowish thing. And so I realized then my science teacher was not lie to me, because when I was in middle school, my science teacher said that, depending on the temperature, high-temperature stars are bluish, low-temperatures are reddish. But I've never seen the red star, blue star at all. But in space, because we don't have any atmospheres, I could see the original color of the star without a telescope. So whole night sky was the really color. So if you watch the black-and-white TV on here, and then astronaut in the space station, we could see the full-color, HDTV in the night sky. So that was really wonderful.

GN: And what did you find most challenging about being in space? What was the most difficult?

SY: First of all, all the Korean space experiment is the first time. And then the person who designed, they've never flew—fly their machine before. So some of the machines are working really well, but some of the machines is unexpectedly working not good, and then I should impulsively fix it and change the protocol, change the manual. So that is really challenging for me because the person who designed—the person who operate it, they are not here. I cannot have a right-on-time communication at all, so I should use my own knowledge, my own intuition to working it. But what if they didn't like it? What if it's not the way they really love to try it? So I should keep debating in my brain. Is it okay doing that way? Is it okay that way? Because it's not working in that way. Or sometimes it's some power outage sometimes—without any reason. And then some experiments are really sensitive with continuously power going in, and then I should start all the way from the first or I should start from that time inside of the material is how much sensitive it is. I'm not the—fully professional about that.

So I keep having the—making decision on top of the incidents. So that is really challenge. And then I'm not the non-STEM person. And I always sympathize myself: what if I'm the person who in charge of this experiment? And as a researcher, all the experiments, all the tools are your own baby. So day one, even if they take their baby in a daycare, they want the daycare teach a trick exactly like Mom, right? So I'm more like a daycare teacher. They are more like a baby. So I feel so careful. What if I made a mistake? What if it's not the way they keep doing that? So that is really challenging. And also, even if sometimes daycare teacher cannot help it, baby falling down. Baby had a scratch. But Mom's running to it. "Oh my God, how can you do that? You should watch them," right? So, you know, space station, I cannot help to make something happen, but researcher could have told me, like, "You better [be] careful more and then you should take care of this more." And then all those things are coming around my brains. "Oh my God, what if he blame me? What if this make the results totally opposite way? What if this make a huge fail for them?" So that is really stressful.

01:35:07

[Soyeon's song]

GN: And you've told one story about a song that you sang on ISS. What is the story behind that and how did that—

SY: Oh, yeah, right. I don't know why, but there's no reason why I love the "Fly Me to the Moon." And not by the Frank Sinatra, but by the Julie London. And then that song is a theme song of the—what is that? It's one of the Japanese animation. They have a theme song "Fly Me to the Moon." And I accidentally heard that song around my college year or around my master's...? Anyway, around that time I heard that song. I thought that song is really beautiful, without having any reason. I just hooked up. And I just read all the lyrics and then memorize it and then singing by myself. At the time, I even couldn't imagine to be an astronaut.

And in Korea, we have not only ringtone but also caller ring. So ringtone is whenever you have a calling from your friends, your phone ringing with that song, right? But in Korea, we have a caller ring. What does it mean is when you call somebody and then you should hear the really boring sound, beep, beep, beep. But in that sound, you can change with a song. So if my friend has a ringtone as kind of "All I Want for Christmas is You" kind of thing, and then if you call your friends, until your friends answer, you can hear that song. I think this is smart. You don't—so waiting time is not boring anymore. And then you could feel what is their favorite song. And then you can change it, also. So I felt like maybe "Fly Me to the Moon" would be the best song for me to make a caller ring. So whenever my friends call me, they obligated to listen to "Fly Me to the Moon." Yeah. So I set it up for three, four years.

And then once I became an astronaut, I fly up to the space and astronaut—all my colleague astronauts say that, "Soyeon, it's the last chance to [song?] in space station." And, of course, that's my song. So I sang the "Fly Me to the Moon." So that was kind of my song, even—after being an astronaut, when I was working in KARI in Korea and some of my foreign friends were working in a NASA and Roscosmos, they knew that my caller ring is "Fly Me to the Moon." So one of my friends who was maybe a Secure Foundation or Space Generation and then they needed to call me. But there's a kind of country code and some service code and local numbers, so whenever you call to the foreign country, you cannot be sure if you call right number or not. So they say, "I just—"—and say, "Hello," and they say, "I knew it. It's your phone because there's 'Fly Me to the Moon.'" [laughter] So yeah, that was my signature song, actually. Yeah.

01:38:14

[Returning to Earth]

GN: Nice. And so now it came time—your 11 days in space ended, and when it came time to get ready to leave to come back to Earth, you were no longer a—it wasn't like when you got up there and you've just been in the Soyuz for two days. What were your feelings when it was time to head back?

SY: First of all, I thought time flies so fast. Because 11 days is not that short, but I feel like it's just a second. [snaps fingers] And then right after my motion sickness all gone, I thought I'm ready to stay in space station, but Yuri said, "Soyeon, it's time to pack." "Already?" Yeah. So I was not ready to go back. I really want to stay over there. If there's no diplomatic problem, I really want to hide somewhere, not going down. [laughs] But I know I couldn't—I shouldn't do that. So yeah, it feels so sad and then—but also I miss Earth. I miss gravity. So in same time, I'm so excited to going back. It's really mixed feeling. Yeah.

GN: And who were your crewmates for return?

SY: Peggy and Yuri. Peggy Whitson and Yuri Malenchenko.

GN: And your return flight was less than ideal. Can you talk a little bit about what you experienced?

SY: Yeah. [laughs] Yeah, we had a ballistic reentry because we had a problem with the separation. So descent module should be separated from the habitation module and instrumental module, but we didn't have a fully separated. Some part of the habitation module still attached and flop it. [demonstrates] So we lose the balance, and we coming down to the Earth upside down. So Soyuz capsule should have a heat shield on the bottom, originally. So that is to bear all the heat when we going down with the huge friction. But we were upside down, so our hatch should face all the heat. So our hatch is almost on top.

So as I heard from the investigation team, if we expose to the heat more than several seconds, we would be all killed because hatch would be all burnt. But we just passed that small little window to survive. So that was a really, really interesting moment. And because of that ballistic reentry, we should have a higher G. And even before having the red alert for the ballistic reentry, I could see something blinking outside. And I told Yuri, "Yuri, I think I could see something," but I—during the training, I learned I suppose not to see anything. And he said, "Soyeon, it would be the hallucination because it's your first time flight." [laughs] And I just think he would be right because it's my first time flight. I was so excited. Maybe there's imaginary kind of fireworks outside. And yeah, maybe. But Peggy—after a while, Peggy said, "Yuri, Soyeon was right. I could see something outside." And then we realize that something happened. But all the board and

computer said everything's normal. So we feel suspicious. But right after several seconds or some time and then whole lights comes up, and then computer said we will go down ballistic reentry because we lose the balance.

And we had huge G, and then I told Peggy, "Peggy, I realize the G is too big and it's more than I expect." And then Peggy said, "Because you are from the zero gravity. It's relatively big, but it's not bigger than the normal." And after a while, she said, "Soyeon, you were right. It's much bigger than the normal." "I told you." And it's a huge G, and then kind of six and eight G, and then maximum for several seconds is almost 18, 20 Gs. But we couldn't remember because it's too short. So yeah, that was a really dramatic kind of dynamic things.

But I take as kind of good luck and a huge opportunity because, as an astronaut, you don't have that many chance to have those critical moment to get through. And as an astronaut, our military guys, it's a huge kind of experience and medals, and there is opportunity to prove yourself you are ready to be an astronaut. So my case is, because I am a Korean and younger and woman, still some of the Russian old astronaut, they take me as a real colleague. But after accident, they all come to me and, "Oh my God, you did a great job." And then, "I knew it. You made it." And then, "Please tell me what happened. Please tell me what you did." And, "Oh my God, that's incredible." So those accident was a huge opportunity for me to be more closer to all the other astronauts and colleagues.

GN: And so once you got the warning that you were going to go through a ballistic reentry, was there anything that you as the crew had to do or was it just sort of—

SY: No, not at all. Just sit back and then read the manual. And then we just checking all the parameters and factors and anything we should do something, we should be ready for that. But we don't have any control once we have ballistic reentry, yeah. We just go down as a bullet. Yeah.

GN: And you ended up landing, because of that, off target?

SY: Hm-hmm [affirmative]. So basically, if you have a normal landing, even before having a touchdown, there's three helicopters escort you. And once you touchdown and then whole search-and-rescue team inside of the helicopter, they come to you and they open the hatch. They pull you out of the capsule. But we realize that there's no helicopter outside. Actually, you know what? We just hoped to have, even if we lose the communication, even if we had a ballistic reentry, we just thought maybe mission control could find us and follow us. But finally we realized that they didn't know where we are.

And we touched down and we wait for a while because at least search-and-rescue team come, they will open the hatch and then take us out. And then for 10 minute or 20

minute—for a while we wait, but nobody come. Because once somebody come they just knock, but no sounds at all. So Yuri decided, “Soyeon, let’s get out by ourselves. I will open the hatch, and then you just crawl up and then get out of that.” Because we are landing on the side. We just bouncing inside. So I was on the bottom, and Yuri Malenchenko was in the middle, and Peggy was kind of dangling. We were kind of like that. [demonstrates] And then Yuri said, “Soyeon, because you are on the bottom, once I stand up and open the hatch, you just go over me and then get out of the hatch.” And I get out. And Yuri tried to get out, but we are so tired and then we are not accustomed to walking on the gravity, so we cannot be sure—can we help Peggy. Because Peggy was dangling, so somebody support her, somebody untied her, but Yuri and I, we cannot be sure we can do that

So we told, “Sorry, Peggy. Let’s get out, and then we will check it out if there’s anybody who can help us. And we will check.” And then we get out, and we just lay down on the grass and then talking with Peggy and then Yuri. But finally, some nomadic shepherd in Kazakhstan, they saw something coming out from the sky and they followed that because it’s really weird. And then we found some of them. Even if they cannot speak Russian well, we had a communication with them, and then they support Peggy and then Yuri untied it and then they carried Peggy out of that. So those nomadic shepherds help us a lot, yeah. Until the search-and-rescue team coming to us, yeah.

GN: And how long did it take the search-and-rescue team to reach you?

SY: Thirty and 40 minute. Actually, they finally couldn’t find us. So we ask the nomadic people, “Anybody has a cell phone?” And then they don’t have any cell phone at all. So we find a satellite phone, and then Yuri did the phone thing. And we called the MCC, literally. [laughs] And we call our GPS location, and they come to us.

GN: Did you just have a list of phone numbers in your—

SY: I don’t know because I’m not the person who use the phone. But as I believe, they have several [memories?] to call, yeah. And at least Yuri should memorize them. [laughter]

GN: So after your flight, how had—what was your life like after the flight? Had things changed?

SY: So that is a huge misunderstanding between me and [Walt?] and between me and Korean general public. Because my case is I was the PhD student. I was engineer. I was dispatched to the Russia as an engineer from the KARI, and I was dispatched to the space as an engineer also from the Korean government. So I felt like I just went to the space to do my job and then coming back, as you can go to the Boston or Korea as an employee of The Museum of Flight. So I feel like that.

But Korean people, they have suddenly has an astronaut, you know, second. And they just think I was changed from the engineering school student to the astronaut. But I feel like I'm just Soyeon. Before being an astronaut, I was Soyeon. Before being an astronaut, I was engineer. Even after being an astronaut, I was engineer and scientist. So I think I'm just same. But I feel like they are changed because they treat me totally different. Before having spaceflight, they don't care about me. I'm just a student. But right after coming back, everybody recognize me. Everybody praising me. And then whatever channel rotating my face is on there. Oh my God, why people treat me totally different? And they think, "Oh my God, she's totally changed from the—just a student to the astronaut."

So we had a huge kind of gap between us. And then that was really harder to handle for me. I'm like, how can I handle people who recognize me? How can I handle all those interview and media covering thing? Because I didn't mean to be a celebrity. I didn't mean to be a famous person. I just want to be a person who take care of the experiment in space. So psychologically, that was most challenging and hard part after my flight.

01:49:02

[Spokesperson work at KARI and involvement with the International Space University]

GN: And so did you stay with KARI as—

SY: Hm-hmm [affirmative]. It was obligation contract. Right after flight, I cannot resign from KARI for two years. And after two years, I can resign whenever I want to do. So I'm waiting for the two years because I was not a rocket scientist. I was not a satellite person. So without a spaceflight, I don't have any kind of job to do based on my track record. Because I did micro machines, but KARI was not the place to do work with the micro machines. So I thought like maybe for two years I can serve for the KARI as a spokesperson or a public outreach kind of activity, because all my speaking engagements was lined up and all my TV interview, radio interview was lined up and I thought like two years would be quite fair. Because I had a training one year in Russia and Korean government has spent huge money for my flight. Not because of me, but because of their own mission. But anyway, I thought it's kind of fair.

And served for two years, but after two years, I realized there's still long line of the speaking engagement requests and still a lot of the media interest. And I feel so grateful for that because most of the celebrities, they forgotten after a while. I just expect also maybe I will be forgotten after two years or three years. But still people remember me. Still people want me to have a lecture. So that was really good. But five, six years later, I thought it's too much because it's not the job I would love to have. Because when I studied in engineering school, I don't want to be a celebrity. I don't want to be a person who always on the TV. I don't want to be a person everybody recognize me. But if I still working in KARI, only job I can do in the KARI is a spokesperson or a public outreach.

So that's the time I thought maybe I better get out of the program. Because there's no astronaut program anymore, and there's no human spaceflight program anymore. Then there's nothing I can do except public outreach. Then I don't want to spend all my life as a public outreach or a spokesperson for that. I really want to use my own skills. Yeah. So I think of to take a leave of absence from KARI to get out of that loop. I didn't mean to resign, actually, that first time. I just thought I better have a sabbatical break, as all other researchers do. Maybe I can do a sabbatical break for several kind of year or two and then I can come back and then find other assignment, other job. But life is always going in totally other way, so in other way.

GN: So was that when—so in 2009, you went and studied—

SY: No, it was 2012.

GN: Oh, this was in 2012?

SY: Yeah. So 2010 was my obligation was over and that time is already—I served for the KARI for four years. And 2011 and 2012, I thought maybe I can get a leave of absence for one or two years. Because every day having a lecture, every day having a TV interview, is too much for me.

GN: But so while you were at KARI, then you took—you got involved in—enrolled in the International Space University?

SY: Yeah, yeah.

GN: What prompted that?

SY: Yeah, that was interesting because, even if I'm an astronaut, I cannot be the person who knows everything about space. But kids and general public, they expect astronaut knows everything. So they ask me about black holes and Big Bang and they ask me about rocket, they ask me about satellite. But I had no idea because my background was not aerospace engineering. My background was not astronomer. But some kids ask me about constellation in the night sky. I had no idea. But to the adult or to grownup, I can tell them, "You know what, astronaut was not astronomer. You know what, astronaut is not a rocket scientist. I am a mechanical engineer. I trained by the people and then I take care of the experiment in space, so I have no idea about the rocket. I have no idea about the constellation." And then adult can understand. But kids, it's different. Kids feel so disappointed if I said, "I don't know." So I at least pretend to know something. So sometimes I should study. Even if it's not my major, I just studied to meet the kids. Because they write the letter, "I really want to ask this question to the astronaut." Oh, my God, I have no idea about this. And then I study and then tell them as a professional.

So for the general public who has no idea about STEM, maybe I better to study about space in general, even if I don't have to be a professional. So I'm thinking about how can I train myself? How can I learn about space overall? And that was a huge headache for me. So sometimes I read some science comic book and sometimes I read some encyclopedia, but it's too much. And I heard about ISU program. Their summer programs, overview of the whole space things in nine weeks. Oh, that's a good idea. And then I apply and then I decided to join the program [unintelligible 01:54:43]. When I go there, all the students ask me, "Why astronaut here? You already know everything." No. [laughs] Because I don't know, I came here to learn. Yeah.

01:54:54

[Decision to move to the United States]

GN: So what ultimately prompted you to move to the United States?

SY: First thing is I just want a leave of absence. I want to have a sabbatical break. And where should I go? And I have several candidate. Should I go to the Africa because I already have some relationship with Africa and NGO and charity group? And then I'm just thinking about, what if I go there and then [unintelligible 01:55:24] for them and then do some volunteering? And else is, what if I go to the Russia and then to study more about the space and everything and then to refresh my Russian language? And what if I go to the other country or Japan or Europe? Because, basically, I really want to leave Korea for a while because wherever I go everybody recognize me and then it's really hard for me. But which country and where and for what. That's the question. And also, Korean public, how can they take it if the astronaut want to leave their country? So that was a huge headache for me and then thinking about it.

And I asking several advice from the person who knows about the media and then everything. And then I met several kind of scientist who has active role out of the country and then come back, kind of thing. And then one of my close friends—journalist—told me, "You know what, Soyeon? Korean culture is always admired a scholarly people and academic people. Even if you are a PhD, if you tell people I'm still—I still have something to learn more, I still have something to study more, and it would—looks like more humble action. And then if you say I want to study something more for serving better for my country, then it would be kind of not that huge against feeling to you."

So I thought, oh, that quite makes sense. But I already got a PhD, so maybe I cannot go to the engineering school. And what else? And then thinking about, yeah, maybe—what if I can learn about science and technology policy and then helping the policymakers or congressmen or government official to make a better strategy for the future of Korea? And what if I learn more about business or financial things, and then I can help engineers

to get a grant or a budget and then maybe can be the spokesperson for them or can help the businessmen to invest money.

So those are things that comes up on my mind. And then trying several different things, and finally I picked the MBA program to be kind of like person and to learn more about non-STEM things, but a set of tools to help the STEM people better. So I applied several different MBA programs and finally got an admission from the UC Berkeley. And I promised my mom and, “Mom, MBA program is two years. So maybe two years of studying in U.C. Berkeley, one or two years working experience in Silicon Valley, and then coming back to Korea and then everybody forget about astronaut, then I can get a kind of job and then maybe I can marry and then I can be a kind of normal Soyeon at that time.” And then my mom totally trust me and then, “Okay, you should promise to come back in three years.” And, “Okay.” And then come and then accidentally I met my husband-to-be. [laughter] And he’s American, Korean-American, and then proposed. I said yes and settled down in Pacific Northwest.

GN: And you mentioned that you’d initially started—intending this to be a sabbatical when you came to the U.S. And then what ultimately prompted you to retire from the Korean Astronaut Program?

SY: Yeah, right. So I had kind of like sabbatical break, and then my plan was, once I finished my MBA, maybe I can go back to the KARI to join some space program and strategy team to making future policy or strategy planning. Because KARI has those kinds of huge team, to thinking about policy and strategy. Or if I learn more about business, maybe I can come back to Korea and then join the tech company to help them, the managing the engineers and thinking about the strategy for the business strategy kind of thing. So that was my scenario. Yeah. So I just—sabbatical break, not resigned.

But once my husband proposed and married and then finish the study, and then I realized that once I go back to Korea, my husband doesn’t have anything in Korea. He doesn’t have any family at all. And his job, basically he cannot find any job in Korea because his job stick to the U.S. because his license as a doctor doesn’t work in Korea. But my case, I can either work in Korea or work in U.S., so maybe we better settle down in U.S. And on top of that, thanks to being a celebrity in Korea, I can meet a lot of the celebrities in Korea. And some of them’s already parents. They have kids. And I learned a lot about how hard the kids of celebrities to live inside of those society. Not only in Korea. Every single country, celebrity themselves is okay, even if they have a huge scandal, even if they have a hard time, because it’s part of their job. But kids—and whenever they go to the school, if their parents in newspaper articles not that good, they could be bullied and then some friends laugh at them and talking about their parents is a nightmare, is really nightmare, especially around the teenage. So I met a lot of friends who raised their kids

outside of the country because—to protect them. And then bring them back around the college or more. Then they can understand the situation.

So when my husband proposed to me, I'm thinking about, should I bring this guy to go to Korea or should I settle down in U.S.? And once we married, I should think about my family. What if we will have a kid? For them, is it okay to go to the Korea and for them they go to the school in Korea and what if they have a F on the math? Then teachers say, "Oh my God, you are an astronaut's kid. Your mom is a PhD. How can you get an F on the math?" And what if they are not good at athletics or sports? "Oh my God, your mom is an astronaut." [laughs] And all their friends, also, "Your mom is an astronaut." Or, "How can you do this," kind of thing. What if some newspaper article's talking about me in bad way, not a good way? Then all the classmate come to—"You know what? Your mom is betrayer. You know what? Your mom is a [unintelligible 02:01:59]." So maybe that would be the huge problem.

And then I think, yeah, I better settle down in U.S. and make my family here. But whenever I have something to do in Korea, I can fly down to Korea whenever. Because nowadays the global society is so small. So if I get a job in Korea, maybe I can go back—go and back and back and forth. And if I have a job in U.S., I can raise my kids, and then whenever I would love to visit Korea, I can bring them. But maybe their teenage or early age should be kind of distant from Korea. Because in one huge interview, I saw that one of the famous actor, he has his kids in L.A. because—and then he visited their kids and asked them, "What makes you guys so happy?" And then these kids said that, "Because I don't have to be a son of Mr. Somebody anymore here. I can be myself here." So that struck me a lot. Yeah.

And astronaut's kids, they cannot deny me at all. Wherever they go, cannot help it. And then Sergey Volkov, the guy who fly with me, he was also astronaut's son. And he told me that was really hard because his dad was the hero. And, of course, he did really good, but, of course, it's really hard. So that made me decide to settle down in U.S. and that made me decide to resign from KARI because I don't know when I can come back to Korea. I cannot hold my position for 10 years or 12 years. They should hire some other people. So I resign. But there was a huge decision for me.

GN: And what was the reaction when you resigned?

SY: Some of them—most of them, as I know, they just accept it because it's my life. And they knew that I finish my old obligated role. They knew that I served for KARI more than my obligation period. For some newspaper article, they always kind of love to make noise and they said she's a betrayer and she live in U.S. And then—at the time, I even didn't apply for my Green Card, but some tabloid said, "Yeah, first Korean astronaut became a U.S. citizen." I even didn't apply for a Green Card. Who did give me a U.S.

citizenship? [laughs] And all my friends said that, “Soyeon, you just married several days ago. How can you become a U.S. citizen?” No way. It’s impossible. But some newspaper already said, “Oh, she became a U.S. citizen,” and then that make a huge spiral. So not because I resigned, not be I’m outside of the Korea, but because those fake news I became a U.S. citizen, that is a huge thing. Because even if I’m a Korean general public, if I read that the first Korean astronaut became a U.S. citizen, that is really bad. And I’m not U.S. citizen at all, even right now. I’m Korean citizen and then Green Card holder. So I still have a Korean passport. But they don’t care. They just made a noise.

So those noise make a huge against feeling against me, but I don’t think that’s a big deal because one day truth is always will come and then people understand what my situation is. Because if you are not in their own life, if you don’t see—look them closely, you don’t know what happened. You don’t know what is the real thing. And then some people who just see you really from the far, they always see something they really want to see, even if it’s not the real thing. So that is a kind of still challenging to me.

02:05:37

[Involvement with The Museum of Flight and current activities]

GN: So now that you have immigrated to the U.S. and you’re living in the Pacific Northwest, how did you come to be involved here at The Museum of Flight?

SY: First of all, I love public outreach and STEM outreach. So as an astronaut, I love that job, of course, but sometimes it’s too much. That’s because I left Korea. Not to avoid but to balance out. And here in Pacific Northwest, I really want to keep doing that. And at that time, maybe some friends of mine and that interest me to somebody in The Museum of Flight and then connected each other and then finally I started volunteering at The Museum of Flight. And I love it. And then first of all, I have a Soyuz here. [points to Soyuz capsule behind her] Not that many science museum had a Soyuz capsule in there. Even in Russia, not that many museum has a Soyuz capsule in there. So I have a huge connection with the Soyuz capsule. Personally, I feel so appreciate Charles Simonyi to have that here. So yeah, it’s good to be here and working with you guys.

GN: Wonderful. Well, and we absolutely enjoy having the opportunity and that you’re so game to come and do interviews or come and speak. And I think the first I heard was when our Director of Education, Seth [Seth Margolis], mentioned that you would show up and talk to the summer camp kids in your outfit—or in your flight suit. So one—you had your MBA. You had completed your PhD. What was your career plan once you had resettled here in the U.S.?

SY: If it’s possible, I really want to take advantage of all my background as an astronaut, as a global experience, all different kind of country and people and as a PhD—engineering

PhD, has a good intuition about the engineering. And even if I've never walk in a business world before, but MBA had a kind of good opportunity to teach me about the business world. So I'm looking into, if it is possible, maybe commercial space company, and then that would be the kind of huge combine all of them. Or any tech industry or tech company who really want to have person who has all those insights and that kind of thing. So I'm looking into it.

So still I'm networking people and then finding the opportunity. I cannot figure out exactly what position, exactly what function would fit me, but I really want to be flexible to fit me in the place they need me. So still exploring. And then I'm not good at U.S.—American recruiting system. I'm not good at the networking yet because recruiting system by the country is totally different. I already accustomed to have a Korea system. So I'm still learning about that. And a lot of the experienced position and job is through the network, not by the resume or kind of application process. So still I'm working with the networking with the people and then trying to expose myself to the people. I'm here and you can use me. So kind of like a sport player—athletic player in FA market. [laughs] I'm here. You can pick me. So yeah, it is right now my status.

GN: Got you. But you're also teaching?

SY: Yeah. I'm also teaching because—not only because I love teaching, but also because teaching job is kind of easy and reachable as a PhD holder. So not many people believe that, but as an astronaut, it's harder to find a job right away. But as an adjunct faculty, adjunct instructor to teach the physics in university is always opportunity coming up. They always try to find an instructor to hire. So that was a kind of instant job I can have right away, not because that is my ultimate job I really want to have.

02:09:48

[Thoughts on the future of the Korean Space Program]

GN: Got you. So just a couple more quick questions. What do you see as the future for the Korean Space Program? Where do you see Korea going in space?

SY: Korean Space Program has—first of all, they really want to have a launching capability. Because Korea is really good at the small satellite, but even if you made a really good small satellite, if you cannot launch, that's useless. And also, Korea has a real interesting political and geometrical location right next to the China and Japan and North Korea. So they are so sensitive to the security. So they really want to have their own satellite and launch capability. I think that make totally sense. They really want to watch around their area. And surrounded by the U.S., Japan, and China, it's really a hard place. [laughs] Think about it. You have 600-pound peoples around you, and you're a small, little guys,

and it's really tense. So in that kind of point of view, they really want to have a launch capability, not for the missile, but for the satellite-launching thing.

And then KARI has a huge direction to have developing the rocket. And another thing is, you know the Samsung. You know the LG. And in Korea is really good at small, little electronics, and then that is related with the satellite capability and then small, little satellite and functional satellite thing. So huge part of the KARI, huge part of the career as the space program is looking to the small satellite market. So they have two big, huge kind of branch, and astronaut program was kind of tool to promoting that program. So current astronaut program is not for the astronaut program like America or Russia. They really want to make a huge general public campaign to inspire about what the Korea is doing for the space field. So I could be the MC or moderator during the Korean rocket launch, and whenever we developed a new satellite and I have a TV interview and talk about that. So that was the astronaut's job at the time. And in the future, I believe Korea would have a really firm launch capability, especially small satellite. Not huge one like a Saturn V. And also, they could spread and then working with the other big, huge countries and provide the small, little apps and device or part of the satellite. So I hope Korea find their own edge, their own kind of skills and talent for that. And then that would be the future.

But, of course, if commercial space comes up in not only U.S. but also China and Russia, maybe Korean satellite can be launched through those commercial things. And, of course, Korean peoples also interested in human spaceflight, but not just sending the astronaut, but sending the researching or scientific experiment. So I'm a huge fan of the commercial space because nowadays, to send our experiment, our research, only through the China, Russia, or America, and then you should go through all the complicated politics and diplomatics. But once we have a huge commercial space comes up, it's easy to sending anything to the space only by the business side, not by the diplomatic side. So then maybe Korea would have more opportunity to send more things in space and to play more actively in space, I believe.

And then I really have a huge hope and wish I can contribute for that. So if I have a good firms and good position in U.S. and good relationship with the commercial space sector, then maybe I can be the mitigator or a good spokesperson between the Korean government or Korean Space Program with the commercial space sector. Because between the Russia, America, and China, it's a small, little player. It's harder to collaborate with either one. Because if you play with America, you should give up with China or Russia. If you work with Russia, you should give up either China or America. So Korea has a really tricky position, actually. So commercial space would be the kind of breakthrough for them, I believe.

02:14:22

[Favorite aircraft and first flight experience]

GN: Excellent. Thank you. So last two questions, which are—we ask all of our interview subjects here, what is favorite airplane?

SY: Ah, airplane. That's interesting. I would never think about an airplane before. And then—you know what, I'm not a huge fan of airplanes, so whenever I buy the flight ticket I don't care which airplane I will take. But when I take the A380—it's an Airbus one—oh my God, too many business class on top. So even if I was in a business class, I couldn't feel like I'm in a business class because everybody's in business class. It's not any exclusivity. And most of time, I took the Boeing 737 or 777 kind of thing because it's the most common in Korean airline and Asian airline. So pretty much I prefer to take the Boeing one, but I don't care which one is more. So frankly, I have no idea about airplane. But I really want to try the very classic, old kind of—how can I say—that's kind of two layer of the wings?

GN: Biplane?

SY: Yeah, biplanes. And kind of fans in front, kind of thing. I really want to dream to fly with that. And then even if I don't have any idea about airplane, I have one goal to make in U.S., even before immigrate, even before moving in U.S., I have a dream. And in Korea, it's not easy to get a flight license if you are not a military because most of the airport is under control of the military. Because Korea is a small country, several airport is all right next to the Air Force airport and then together. So as a civilian, it's harder to be a pilot.

But when I was even college student, I heard that in U.S. everybody can learn how to fly. So I had a dream, if I have any chance to live in U.S. more than a year, if I can afford it, I really want to learn how to fly. And once I apply for an MBA, got an admission, I thought, oh yeah, I know I will spend all my life saving for tuition, so I cannot afford it. But whenever I can find a stable job, I will check in the flight school. And I really want to get a flight license. So that is still my dream. I cannot start yet because I don't have enough money yet. But whenever I got enough money, I really want to learn how to fly. Then I can find my favorite plane.

GN: And last sort of related question: do you remember the first time you ever flew?

SY: Yeah.

GN: And can you tell us about that?

SY: When I was middle school student. Not the international flight, but from my hometown Gwangju to the Seoul. And Seoul—I have uncle who live in Seoul, and we—every year we visited my uncle and then my uncle's family visited us. We go and back. And my mom and dad, they cannot afford to buy the airplane ticket, but they knew that we all kids

love to try it. And then it was around mid-1990s, so in Korea, not many peoples have experience to fly at that time. Nowadays, everybody fly. So they just try out. So it's only 20-minute flight from the Gwangju to Seoul. And so 30 minute, 20 minute. Nowadays, I would never take an airplane from—to there. But my mom and dad, with the small little money, they really wanted their kids to fly because they cannot afford to buy—go to the Japan or Southeast Asia.

So I still remember. And then all three of us, my brother and sister, was so excited. “Oh my God, we are flying!” But, you know, more funny thing is, from Gwangju to Seoul, it takes four hour driving at the time. From my house to go to the airport, it takes 30 minute. And then we wait and then go through the gate. It takes almost an hour. So we should go to the airport to take airplane two hours before, right? So two-hour wait. And 30-minute flight. And from the airport to my uncle's place there's a huge traffic. It takes three hours to driving. So total hours is almost six or seven hours, so it takes even longer than driving ourselves. But still, I have a really touching memory, we had a first flight. Yeah. I still remember. Yeah.

GN: Very cool. Well, Soyeon, thank you very, very much for—

SY: Thank you.

GN: —agreeing to this evening interview. I think we are all done.

SY: Cool.

02:19:15

[END OF INTERVIEW]