INTERNATIONAL SPACE STATION PROGRAM
ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT

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INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is July 30th, 2015. This interview is being conducted with Michael Barratt as part of the International Space Station [ISS] Program Oral History Project, at the NASA Johnson Space Center in Houston, Texas. Interviewer is Rebecca Wright.

Dr. Barratt was selected as a member of the astronaut corps in 2000 and as a mission specialist flew on STS-133, as well as in 2009 lived 199 days in space as a member of [ISS] Expeditions 19 and 20. Prior to becoming an astronaut, as a physician and NASA flight surgeon he helped to establish medical systems and operations for the Shuttle-Mir Program and for the ISS. Recently he served as Manager of the Human Research Program here at JSC. Thank you again for taking time to talk with us today.

BARRATT: My pleasure.

WRIGHT: You've spent more than 20 years involved with aspects of the International Space Station.

BARRATT: That's hard to believe.

WRIGHT: Especially in the field of medical operations and research. If you'd start today by sharing with us what you believe to be some of the most significant challenges during these years.

BARRATT: I think some of the most significant challenges of course were working with our international partners. In particular working with our former Cold War adversaries, our Russian friends. I started in the Shuttle-Mir Program as we were working our joint missions flying cosmonauts on the Space Shuttle, flying astronauts on the Soyuz once at least, and then up to the Mir Station for long duration flights. We were also at the same time giving birth to the notion of an International Space Station in place of Space Station Freedom.

Those of us that were heavily involved in the Shuttle-Mir Program realized two things. How wonderful it would be, because we found that we could work with our Russian counterparts quite well, and how difficult it would be, because they do things very differently than we do. I think if anybody had asked us what a good model for making a Space Station would be, the answer would not have been to choose a major partner who speaks another language, who uses metric system rather than English system, who has a totally different engineering philosophy, safety culture, methods of operation, methods of manning. All of that was different.

We realized just how different by working Shuttle-Mir. Putting that together into a Space Station Program we knew was going to be very difficult. The flip side of that is that the Shuttle-Mir Program set us up to do that quite brilliantly. Without the Shuttle-Mir Program I can't imagine starting from scratch and going into such a large program as the International Space Station.

WRIGHT: You found lots of differences, but what were the commonalities that moved you forward?

BARRATT: Certainly the rubber meets the road for operations, either the crew on board or those who support it on the ground. Once you get past the language barrier, people understood that the laws of physics are the same, the laws of orbital mechanics are the same, zero gravity is the same, and it was pretty easy to find common ground amongst the crewmembers and the supporting engineers. Really language was the only thing in the way there. A lot of U.S. engineers learned Russian, a lot of Russians learned English, which was quite wonderful. Once we got through that, we found that we could work together pretty well.

There are some things that we do from a common function standpoint. We both do EVA [extravehicular activity], but their suits are different. Different pressure, different operating envelopes. We both do spaceflight but their ship is different. The Soyuz obviously is a small commuter that takes three people to work. The Shuttle takes many people and large payloads, but the elements of spaceflight are still the same. We worry about the same things—fires, leaks, toxic atmospheres. In spite of those differences it wasn't difficult to find common ground on how to solve problems.

WRIGHT: Your role changed because you took a lot of experience and a lot of experiences, and moved them toward becoming a flight member. Talk about what you feel like you learned as an Earth-based person, a ground support person, during those years and what lessons you were able to take when you became a flier. Then also some of the lessons that you learned from other fliers that you were able to apply to helping those that were in space.

BARRATT: Of course I worked as a flight surgeon/medical officer during the Shuttle-Mir years. I have to say that it was working with the Russians in the long-duration flight programs that made me interested to apply to the Astronaut Office in the first place. Working the Shuttle missions was really amazing, but when you look at long-duration flight you're looking at the scenario that's going to get us further than low Earth orbit, and that was really interesting to me.

If we're going to Mars, we're going to asteroids, we're going to spend long periods of time in weightlessness. Exactly what the Russians were doing, exactly what Shuttle-Mir was all about. That compelled me to apply, and I was very very excited—and it was very unexpected actually when I got accepted—but I was very excited to get into the Astronaut Office.

You realize mostly the common ground that you have with your Russian counterparts is one that you could carry beyond the Shuttle-Mir Program into International Space Station Program. Having gotten several years of success under our belts, it's a model that we can carry further if we want to, to Mars, to asteroids. I think probably the biggest realization coming out of the International Space Station Program for me personally, and I think for a lot of us, is that we now have an international model where partners can come together. We recognize where our contributions are the strongest, and it works, and we can go forward with this model, I think, which is quite amazing.

Also I learned a lot from the long-duration fliers—both U.S. astronauts and Russian cosmonauts—in my flight surgeon role. I went in with my eyes wide open as to what these guys were facing, the long preflight training, and grueling preflight training. Lots of travel away from home and long periods of stays on the International [Space] Station, like a military deploy if you

will, and then rehab [rehabilitation] afterwards. I think I had a fairly good idea of what I was getting into and how it was approached by both sides.

At the same time you could realize the strengths and weaknesses of both programs. There are some things that again our dominant partner Russia does better than us and some things we do better. Learning how to bring the best to the table from each side, we learned from the medical world going into the ISS Program, and we really wanted to carry that forward into the ISS. I was very interested in that.

WRIGHT: I remember as part of Shuttle-Mir you had created a dual checklist so that someone could see how to do an operation or technique in their own language, the two languages. You would hope that that would carry forward along with other lessons that you had done. But, along with Russian partners you also had other partners. How did all of that adapt to not just one, as you mentioned the dominant partner, but how were you able to adapt those lessons to the other partners that have residents on board?

BARRATT: Interestingly the medical group was one of the first to integrate across all the partners as the International Space Station was being born. Very early in the ’90s we formed a group called the Multilateral Medical Operations Panel, and there were two multilateral medical parent groups above that as well.

Very quickly and very early we engaged our counterparts from Japan, from the European Space Agency, from Canada, along with our Russian counterparts, and we formed a working group that was in operation for five or six years before the first crew launched to the

International Space Station. We did a lot of sausage making before we actually started working our crew support up there.

All of us had worked jointly together in some form. We'd flown JAXA [Japan Aerospace Exploration Agency], the Japanese Space Agency astronauts, Europeans, and Canadians on the Shuttle before. We knew who the contacts were. Bringing the Russians in for the Shuttle-Mir Program gave us a complete playing field to get ready for the ISS and forming these multilateral partnerships. We really had operating plans in the medical world well in advance of almost every other group. That served us extremely well going into the ISS Program.

People understood each other amazingly, shockingly quickly. I think a lot of us who started these programs, myself, my partner Dave [David F.] Ward, another flight surgeon, and Roger [D.] Billica, who was our very insightful and very diplomatic Medical Operations Chief at the time, I think we were very successful in getting people to the table and getting them to talk.

The group had its own dynamic, which was self-propelling from the early days, and we had our first requirements document out I think quite a bit before any other discipline. We were very fortunate in the medical world. I think just having that human element involved, the direct crew support, jelled that. People were used to associating names and faces and friendships with the products that we were producing, and I think that helped us a bit.

WRIGHT: Sounds like the medical language was a commonality in itself.

BARRATT: Medical language is definitely a commonality. An irony is that one of the cosmonauts that I trained during the Shuttle-Mir era was Gennady [I.] Padalka, who was getting ready to fly his first long-duration flight on the Mir station when we had a joint U.S.-Russian

medical kit up there. As a flight surgeon working the program, I was showing him how to use our medical kits and how to use some of the hardware. Years later I was flying with him as his flight engineer on the Soyuz for Expedition 19. He's clearly one of the best space fliers in the business, well known. We've been working together for so many years. It's just hard to comprehend now.

WRIGHT: Since you mentioned that Soyuz mission, I found it interesting that soon after you arrived to NASA you were among that small group of first Americans that ever got to see a Soyuz landing. Then years later you were coming home in a Soyuz.

BARRATT: That's right.

WRIGHT: Could you take a minute to share your thoughts? At what point did you realize that, "Hey, I was one of the first observers, and now I'm part of this crew that's coming home in this spacecraft. I was one of the first people to see from America to watch it land."

BARRATT: Yes, I hadn't thought about that for a while. I was tremendously fortunate to be one of the first Americans in July of 1993 to attend a Soyuz landing. At the time, I was the medical officer on the Assured Crew Return Vehicle [ACRV] project. We were considering using the Soyuz on Space Station Freedom as a return vehicle, and of course that program went away. But, it was our first glimpse at Soyuz operations, how their recoveries went, and how they supported those missions.

Of course the Russians were very new to us; we were very new to them. It was our first encounters together from the operations world and certainly the medical operations world. It was amazing to see the difference between a Shuttle landing, which is very orderly on a runway, and the thumpdown in the desert of Kazakhstan where you're never really exactly sure where it's going to land. It adds its own challenges to recovery. Both systems work quite well, and our learning curve was incredibly steep there. As it turned out, we eventually became partners with the Russians and knew that we were going to fly people on that. It gave us our first information, input to inform that program.

One of the ironies there is that some of the people that I met in 1993 in the medical operations world in Russia continued to work for another two decades after that. One very dear friend of mine, Igor [B.] Gontcharov, who I met during that trip, was at my landing in 2009 working the medical recovery. When I was sitting in my chair still smoking from entry with the Soyuz behind me, Igor Borisovich was helping me get used to gravity again. That was just a really wonderful feeling.

WRIGHT: It's totally different observational experience.

BARRATT: Absolutely different aspect.

WRIGHT: You were able to spend a tremendous time in space as part of your Expedition. Again the lessons that you had learned, now you were able to see how they were going to work. Can you describe those that you felt worked well, and then maybe some that you learned there that you needed to bring back home that you could help for the next fliers? Then maybe some that

you thought had worked but really wasn't working once you got up there to see hands on how it was working?

BARRATT: I think what worked well for me personally was knowing well how the Russians and our other international partners approach spaceflight. Again there are some nuances, there's some differences culturally and from engineering aspects. But, I was fairly comfortable and cognizant of those differences and once we jelled together as a crew, we worked extremely cohesively.

My crew on Space Station was to begin with two Russians, a Japanese, a Belgian, a Canadian, and myself. I was the token, the minority American in a way. The crew worked so well together that we had tremendous fun. We had just an amazing time as a crew together. We were also very productive. We did all of our timeline, we did all the voluntary science offered to us. It was really an amazing mission.

I think that understanding of how to work culturally worked for me, and worked for everybody who was up there, quite well. If I could share some of our times around the galley table—just sharing meals together, listening to music, telling jokes, solving the world's problems up there—which we did every night together as a crew, I think the world would be a better place. It was really quite amazing.

As a medical specialist I've spent a lot of time working out the medical aspects of humans adapting to weightlessness. In between the time I was chosen as an astronaut to when I flew I actually published a textbook on space medicine. My keen interest was to find out whether I had gotten it all right or not. The chance to experience weightlessness and adaptation myself over a long period of time was something I was very keen on. I think I can safely say I

had it about 85 percent right. But, there were definitely some differences that made me rethink how we live in space and how we support and how we adapt. I brought a lot of those ideas down, and I guarantee you the second edition of the book will be a bit better because of my experience up there.

WRIGHT: One of the results or issues that came back with you with your mission was the issue now that people are studying about ocular health. Can you share with us on your experiences with that and where you would like to see those results come from?

BARRATT: Interestingly, the ocular health issue is now one of our top medical risks for spaceflight. It's not something we were even aware of a few years ago. When you think about it, we've been working in space for over 50 years now, and this is a big thing we've just discovered. Personally I was on Station in 2009, myself and Dr. Bob [Robert B.] Thirsk, another physician. He and I talked very candidly about this also.

We noticed during the mission that we were having a little bit more trouble looking at our checklists up close and doing fine work. We'd known for years that people had come back with reports of vision changing, and we'd seen some changes in people's eyes before, but those were very sporadic. We'd sometimes passed that off to age-related changes. We aren't spring chickens anymore these days.

Noticing that, we both did eye exams on one another with the little ophthalmoscopes we have in the medical kit. We thought we saw a small grade of optic disk swelling—the optic disk being the head of the optic nerves that enters the back of the retina. We reported this to the ground and we were able to get some hardware fast-tracked up to us, high-resolution cameras,

which allowed us to get really good looks at the back of the eye, the retina. Lo and behold, there was some disk edema and some other changes, which we've now recognized as part of this overall syndrome of neuroanatomical changes and vision shifting mostly towards the farsighted.

Since then we have instituted a fairly rigorous program of preflight and postflight testing, which includes obviously looking at your eyesight, but also MRI [Magnetic Resonance] Imaging of neuroanatomic structures, the optic nerve, the shape of the globe of the eye itself, and intracranial pressure, which might be an issue for us. Some of us are getting spinal taps, which gives you an indirect measure of the intracranial pressure, and many other measures that we've now been able to do in flight.

This is now a formal program. It's mandatory monitoring for a medical risk which, again, we didn't even recognize up till about six years ago. Now the big question is what happens in the long run. Is this a bad thing, or is this an incidental thing? Clearly it's an aspect of adapting to weightlessness that we've missed. We see the eye changes, but there's much more to it than that. It probably involves more of the brain and more of the spinal cord than we thought because of the pressure changes that probably occur as well.

What does it mean? In the long term we don't tend to see changes clinically of people who have spaceflight careers and live fairly long productive lives, but we don't see what we don't look for. We've not really monitored for these problems. That's one of the big things we're looking at. Are we going to see long-term vision changes or cognitive issues that might be associated with this? We don't know. It's really gone from something that we casually noticed sporadically to probably our number two risk, behind radiation, that really demands study.

When you think about it, the International Space Station is doing exactly what it was designed to do, in that it was our accumulated long-duration flight and the tools that we had on

board, and the tools that we're able to accommodate up there now, that enabled us to really characterize this big problem. We'll come out of the program with a good understanding and hopefully a good countermeasure, or suite of countermeasures, to this problem.

As one of the people who was involved in the early planning for the International Space Station, there was a lot of debate as to whether we should build this or go directly on to Mars. There's good merits on both sides of that argument. There's a lot of money and a lot of resources that went into the ISS.

If we had gone on to Mars we would have been flying missions into deep space. Very low rate, very small numbers of people, and these longer periods in weightlessness. People would have come back with what we see now, with vision changes. The hyperopic vision shift, the farsightedness, the optic disk edema, possibly increased intracranial pressure, some of the other eye changes that we see, we would have had no idea what was going on. To untangle this with a low flight-rate, with a highly expeditionary scenario, could have taken years. It could have taken decades.

It's not commentary on whether we should have gone to Mars or not, but I can tell you that because of the ISS we'll have a full understanding, and hopefully we'll have a suite of countermeasures. That's I think one of the most important aspects of the ISS for us, to find these things. It begs the question, if we missed this for so many decades, what's next? What else are we missing? What have we not seen because we haven't looked or haven't had the accumulated flight experience or the tools available to us? In some ways it's very exciting.

WRIGHT: When you were serving as the manager of the Human Research Program [HRP], what were some of the goals? What were some of the objectives that you wanted to see this program do while you were there and/or that you would like to see do in the future?

BARRATT: The Human Research Program is a strategic research portfolio that looks at all the medical risks associated with humans in flight and tries to figure out what research gaps are needed to best prepare to meet those risks. Either to solve them or to put you in the best risk posture you can. The ultimate goal is exploration, leaving low-Earth orbit, going back to the Moon, going to Mars, and doing so as safely as possible.

The program was doing very well, thank you, when I got there. I was very surprised when Mr. [William H. "Bill"] Gerstenmaier asked me to go lead this program for a while. What I wanted to bring to the program was more of an operational mindset. I was indeed medically trained, and I knew the research community very well. I knew the literature and most of the knowledge base associated with humans in space pretty well. But, having flown, and having supported missions, I wanted to look at our problems a little bit more pragmatically and try to do a strategic turn so that all of the products that came out of our research were easily mapped to solving these problems and very directly supporting human spaceflight.

As my friend Dr. Craig [E.] Kundrot would say, it was like steering an aircraft carrier. I only wanted to do about a 15-degree course correction or so and really get a better understanding of these risks, and make it in such a way that we could communicate these risks easily to a manager of a program, whether it be the ISS or an exploration mission. "Here's the problems. Here's our current status. Here's what we need to do to fix them." We were able to do that. I

think they were more than ready for that type of course correction. If I accomplished nothing more in the year and a half that I was there, that's probably one of the things I'm most proud of.

The other thing is that we actually internationalized that portfolio quite a bit more. Now we had some forcing functions. We had already been working with the Russians for quite some time. We had the multilateral medical operations groups. What we really wanted was a research version of those that included all of the partners, especially our Russian counterparts. We wanted to have everybody look at those same medical risks and agree on a core set of those risks that we would work collaboratively on and try to coordinate all of our research so that we were using the ISS in the most strategic fashion possible.

We're now certified till 2024, but even that is a short period of time when you look at how long it takes to do human research in space. It's critical to have those aligned. That's another thing we started, an International Research Science Office within HRP, and put John [B.] Charles, who's one of the elder statesmen in the international space medical world, in charge of that. That's gone extremely well.

WRIGHT: Have you and your group been able to suggest new projects or new tasks up on the Station that would help further your goals with this? Are you putting actually things in place that will provide the results that you're hoping to get?

BARRATT: I can safely say that no one person puts things in place. We do that collaboratively. To do something in a very evidence-based fashion means you get the smart people together in a room. What I really tried to do was facilitate that process, bring the right smart people together,

and get the practical products on board. I like to think the answer is yes, that I was able to successfully get some of that on board.

Of course my flight time long-duration on Station was 2009, and then I flew again in 2011. By 2012 a lot of our research was oriented indeed to the ocular syndrome that we see. We were able to, I think, work a lot of good research products up there that had quite a bit of overlap with the medical monitoring. That was one large area that we influenced I think pretty positively.

WRIGHT: Are there others that you'd like to mention?

BARRATT: I would say one of the big things is in spite of the fact that we had been working operationally with the Russians for a long time together, researchwise we were not. One of the biggest issues there is your subject pool. If you have an experiment that's only using U.S. subjects or USOS, U.S. [Orbital] Segment subjects, which includes everybody but the Russians, you're missing half of your subject pool. You're also missing half of the investigators who are also very smart people, who if they were working collaboratively could be much more efficient.

Bringing our Russian counterparts in and bringing Russian cosmonauts to the table to serve both as subjects and operators in some of this medical science was a really big goal for us. I wish it could have happened a little quicker, but we're now realizing that. I think that's one of the biggest efforts that we touched off there. I think that's going to help us get to our answers in a timely fashion, given this limited resource that we have.

WRIGHT: Talk about what you're doing now with the Station and how you're impacting what's going on.

BARRATT: Now I've repatriated back to the Astronaut Office. I'm doing proficiency training about 25 percent of the time, and eligible for another flight assignment. Write my boss and tell him I'm ready to go. But aside from that, we all have technical job assignments, and mine is payload science and medical issues. Anything that the crew interfaces with regarding payload science is scrutinized by a small group of people that I manage and we look at procedures, we look at hardware, we look at human factors basically to make that science succeed the best it can.

It's a pretty daunting task because we have thousands of experiments over these last few years and coming up. They're all different. They all have different groups behind them, different procedures, different interfaces, and the crew needs to be able to operate them all. You want those to be as ready as possible, because once you get them up there, the Station is such a precious resource, and crew time is such a precious resource, that you need it to be ready to go and ready to operate.

We try to test everything on the ground and make sure that those are true. That's probably the biggest influence that I think we're having right now. Again, we're working collaboratively the best we can. We're working with our [NASA] Marshall Space Flight Center [Huntsville, Alabama] counterparts who do the lion's share of bringing these payloads to bear, but we're also working with our international counterparts—ESA [European Space Agency], JAXA, Canada—to bring some of their experiments into flight readiness.

Now the new world is commercial spaceflight. That, aside from just commercial vehicles that will carry our crew and cargo, means that we'll have commercial vendors out there bringing

new science packages, new science payloads up to the International Station through a different route. With all these different channels to bring science into Station it's our job to make sure that they're flight ready and good to go.

WRIGHT: Commercial vendors is certainly a significant change that's happened recently. Can you think of others that you can share with us through the years that you've been involved as far as payload science and medical issues on the Station? How it's evolved and changed? It started out looking at it for Shuttle-Mir, and then as the Station grew and the crews grew there was an evolution of how science was going to be done. Can you give us some examples that you witnessed or that you might have been involved in that helped move that evolution through to where it is today?

BARRATT: I think one of the main things is that just looking at the Station as a laboratory, it has grown in capability, and it enables science that we could never do before, because it is power-rich, and it has an incredible bandwidth to it. As it is now, we have six video channels, six audio channels, six crewmembers, and we can just do a lot more. Just having a massive well-powered, very well-equipped laboratory with freezer space for samples, the ability to take blood and centrifuge it for serum, to freeze tissue samples, plants—now we're doing rodent research—the laboratory that we've evolved into is just incredibly capable. Inherently that accommodates a lot of science.

The crew is different. Right now the evolution is towards crewmembers who understand that they are operating science as their primary mission. Because we have completed the assembly, most of our work is not oriented towards stacking new modules and doing assembly-

oriented spacewalks. It really is operating this laboratory. I think you find that the skillset in the crews, especially with the training, has changed considerably.

All crewmembers, to be eligible for flight, now have to take courses in biomedical sciences and animal handling and things that we just would not have thought about before, but that's part and parcel to our work in space. The catchment, the net that we cast, for science is much wider than it used to be. I think there were certain universities that we used to work with on a regular basis. Of course the Agency had ties to other in-house experimenters. Now we go out and solicit research to wide academic audiences and industrial communities. Because of that, we get science that we otherwise wouldn't have had before, which is really quite wonderful.

I think you can see that in the excitement of the crewmembers. When they're doing an experiment, they see something for the first time, and they may be talking to an investigator on the ground who's been waiting years to get their science flown, and the excitement that goes both ways is just palpable. That's an amazing thing, where our Station has gotten to. It is a science machine right now. It's taken a lot to get us here.

WRIGHT: That's a great answer. Thank you for that.

BARRATT: It is pretty cool.

WRIGHT: You have had such a unique perspective, because you have worked on the ground and up there. What do you believe will be the legacy of Station?

BARRATT: The legacy of Station, there's many levels of that. I will probably miss some of the big ones, but I think the first is a demonstrated international model of how we can do big things in space together. After working Station with our ESA, JAXA, CSA [Canadian Space Agency], and Russian counterparts, it's very easy to imagine us going to Mars together, going to an asteroid together. We know exactly who to call. We know who does what. We know again where all of our strengths are that we can bring to the table. We have names and faces. It's an easy leap for us, so I think that's huge.

I think the world stabilization aspect of it is something we sometimes take for granted, but the fact that two Cold War adversaries now work together—in spite of some of the political turmoil that continues to go on on both sides in the U.S. and Russia, the space program has been sacred and left to work independently, and it works very very well. There's no federal agency that works more closely with the Russians than NASA does. I'm very proud of that.

I think the other big product is that there's going to be several very thick textbooks written, because the knowledge base that we get off of Station is broad and it's huge and it's going to be very in-depth. That's something that I feel very strongly about. We owe the taxpayers, we owe the world basically, an organized knowledge base that we've accumulated on the Space Station. That has to be disseminated and freely available.

I know that from a medical standpoint just working on the second edition of our own textbook, getting all that data together is getting harder because there's so much of it, which is elegant, it's wonderful. That's the side of that equation you want to be on, and we really haven't been there for a long time. I think the same will be true with materials science, with combustion science, with basic physics, fluid dynamics, other more basic biology that we're finding on Space Station, radiation biophysics. I think that's really quite wonderful.

I think again just the powerful symbol it is to the world that the biggest thing that we've built together is oriented towards exploration and science. It's not about defense or competition. It's all about collaboration and science. I think it's the world at its best.

WRIGHT: One of the other questions that we were going to ask was if you've got any memorable moments, but you certainly have shared some of those. I don't know if there was anything else personally that you wanted to share over your time with the Station. You've talked about the international cooperation. I guess the only other thing is if you had any recommendations or changes that you would like to see in the next years.

BARRATT: One thing. Recently I was asked to talk to some students from the Bauman Institute in Moscow [Bauman Moscow State Technical University]. This is an aviation/aerospace engineering institute. It's the top tier in Russia. These are really smart kids. They were seniors and juniors in college, and I was asked to speak to them about my experience working Shuttle-Mir and working collaboratively with the International Space Station.

It occurred to me that we've been working collaboratively with our Russian counterparts longer than these kids have been alive. Everything we did to build our coalitions after the Cold War and after the Soviet Union collapsed and after our own space program was drifting a bit—everything we did was history to them. They didn't really live it like we did. The fact that they can just read in a book that we were old Cold War adversaries and that we were more competitive in space, but now accept the new norm of collaboration—we don't know any other way to work, as long as these kids have been alive, I think is wonderful. I think it's one of the best testaments to our International Space Program ever.

WRIGHT: It's a nice history for them to reflect back on. It's good common ground there.

BARRATT: It is. Again it's the norm of everyone their age right now. That's really I think the best legacy we've built so far. They look so young too. They were younger than four out of five of my kids.

WRIGHT: I was thinking about your kids because basically your kids have always had a Station.

BARRATT: Yes, they literally have grown up with this.

WRIGHT: It's like your other home for them.

BARRATT: I spent five years Russia. They also see it as the enemy in a way. It's like a military deploy.

WRIGHT: Thank you for this morning and sharing the thoughts. We appreciate it.

BARRATT: That was painless and easy.

[End of interview]