NASA – Beyond Boundaries

Courtenay McMillan – Fidelity International TEDx "Changing Mindsets" 22 Sep 2016

(1: NASA meatball) When people learn that I work for NASA, usually their first question is "what do you do there?"

(2: WFCR) I am a Flight Director at NASA's Johnson Space Center. I work in Mission Control, with teams around the world and the crew onboard the International Space Station. This picture was taken just over two weeks ago, on September 6, just after the undocking of a Soyuz vehicle to bring three crew members home at the end of their 6-month stay onboard ISS. When I talk about what I do, every now and then someone will say "you mean we have people in space RIGHT NOW?"

(3: 47S crew arriving) Yes. We do. This is half of the crew of Expedition 49: Anatoly Ivanishin, Takuya Onishi, and Kate Rubins, shown on the day they got to ISS.

(4: 48S crew) These three gentlemen - Shane Kimbrough, Sergey Ryzhikov, and Andrey Borisenko – will launch next, to join them.

(5: ISS) The International Space Station is a complex ship, and a busy research platform, supported by research and engineering teams around the world.

Which is all very interesting - but why am I talking to you today? What does human spaceflight have to do with changing mindsets? Think for a minute about where human spaceflight started, and where we are now. How do we work across boundaries – beyond boundaries – and not just fly over them?

(6: E20) This is a picture of a dinner party on the International Space Station - attended by astronauts and cosmonauts from all five of the partner agencies – Canada, Europe, Russia, Japan, and the U.S. I don't know what this looks like to you – I came of age during the Cold War, and to me, this looks like a miracle. But I know from personal experience that it's no miracle – it is the direct result of hard work by thousands of us to make this the face of human spaceflight.

How did we get here?

(7: A-S patch) Toward the end of the Apollo program in the 1970s, the United States and the Soviet Union started planning the Apollo-Soyuz Test Project. It flew in 1975.

(8: crews) A Soyuz, flown by two Soviet cosmonauts, and an Apollo capsule, flown by three American astronauts, would meet and dock in Earth orbit. Like a lot of human spaceflight, it began as a political idea…

(9: mockups) …and then the engineers got our hands on it, and it became OUR mission. We had the first thing we needed for success: a common goal. But you can see that to actually do this, we needed more than just a goal – we needed hardware. Keep in mind: these two spacecraft were built in different countries, using different languages, different units of measure, and different design methodologies.

(10: docking ring) American and Soviet engineers worked together to build that docking interface – and in doing so, we also figured out HOW to work together, and how to build an integrated mission…

(11: mission control) …so we could coordinate across the world to get our two spaceships to the same point in orbit…

(12: crew shot) …and achieve our common goal.

(13: ISS patch) The International Space Station started in much the same way – as a political negotiation – and ended up kicking off the most complex international engineering collaboration in history.

(14: Mir) While we were building the first pieces of ISS, we started a series of 11 Shuttle flights to Mir. In 1995 the Shuttle Atlantis flew up a docking adapter – that orange module on the far right – that was built jointly by the United States and Russia, based on our experience from Apollo-Soyuz.

(15: 2A) Only three years later, in 1998, we flew the first pieces of the International Space Station: the Russian Zarya module, on the left, launched from Kazakhstan, and the American Unity node, on the right, was flown up by the Shuttle Endeavour.

(16: E1) The ISS Expedition 1 crew arrived via Soyuz in 2000…

(17: STS-92) to this: the crew's Soyuz vehicle is on the far left, docked to the Russian Zvezda module, which was the third permanent part of ISS.

(18: STS-134) Altogether: 173 successful launches (113 Russian, 37 US Space Shuttle, 13 US commercial, 5 ESA, 5 JAXA). 224 people have been onboard. More than 100,000 people work at space agencies and contractor facilities around the world to keep this ship flying. People in over 83 countries are involved in the research conducted onboard.

This picture was taken by ESA astronaut Paolo Nespoli from the window of his Soyuz as it departed ISS. We were so excited to get this "family portrait", but it was a tremendous challenge. The Soyuz backed slowly away from ISS, and then held still, flying "in formation", while the Shuttle Endeavour rotated the ISS through a maneuver to get good visibility. All of this had to be done in a way that kept Soyuz safe and capable of performing its landing on time - and without interrupting any of the mission objectives for the Endeavour crew. And I'm pretty sure when we saw the end result…

(19: A-S backroom) we were all just as excited as this group of Soviet and American engineers supporting Apollo-Soyuz. This is still basically what we look like when we achieve a mission goal…

(20: E47 plaque hanging) Well, ok, now we look more like this. This picture is the Expedition 47 plaque hanging – our traditional end-of-mission ceremony. The UK's Tim Peake is on the left with his crewmates Tim Kopra and Yuri Malenchenko. Lead Flight Director Dina Contella is in front of them, in the green shirt. Look at the size of this team – and this is just in Houston, we also had teams in Munich, Tsukuba, Huntsville, and Moscow listening in.

For a team so big, and spread over such distance – it takes tremendous leadership and coordination to keep everyone on track.

(21: iconic FD shot) These are four of our first Flight Directors. They laid the foundations for NASA's human spaceflight programs, instilling key principles that underline our commitment to our mission, to each other, and to our own capability to excel. They built an organization where today…

(22: women FDs) …any of us – every one of us – can work to become that leader. Those of us who now "carry the mantle" for human spaceflight – we work to live up to the standards set in those early days, and at the same time we carry them forward, as we head toward new programs and new mission goals with the next generations of flight controllers and astronauts.

(23: memorial patch) Human spaceflight is inherently dangerous. We have had some very bad days, when we've lost colleagues and friends as well as missions. This memorial patch hangs in each of our flight control rooms, along with the mission patches from Apollo 1, Challenger, and Columbia, to remind ourselves that every decision we face, every action we take – or don't take – could be what brings us to the brink again.

(24: Apollo 13 MOCR) Here's a picture you don't often see – these are the folks who heard the words "Houston, we have a problem" during Apollo 13. This picture was taken during shift handover – the two men seated in the center are the Flight Directors for those shifts. Here they are pulling the team together – literally – to make sure everyone starting their shift knew exactly where they were and what they needed to accomplish together.

We know that at any time we could hear "Houston we have a problem" again, and it could be every bit as serious as it was on that day in 1970.

(25: Luca's EVA) Like this day, in 2013, when Luca Parmitano's space suit failed, dumping water into his helmet. These folks, and the crew onboard ISS, used all their resources to make sure he got back inside safely, and then worked together over months and years – through flights, tests, analysis reviews, and meetings – to understand what happened, and keep it from happening again.

(26: Kate & Tak) That hard work is what lets us continue the challenging scientific research and technology development onboard ISS today, so that…

(27: me in WFCR) …by the time each crew leaves ISS to come home to Earth, we've learned more about the universe we live in and how we function in it.

(28: Bolden) Meanwhile, we're working to define future mission goals, and develop the new spacecraft and launch systems to fly them. NASA is building Orion, shown in the center, along with a new launch capability, to take human exploration farther than we've ever gone. Through our Commercial Crew Program, we are working with Boeing and SpaceX to build new spacecraft and launch systems to keep ISS going for another decade plus. This new way of doing business will – we hope – expand industry engagement in spaceflight technology, and allow NASA to focus on research and development to take humanity beyond Earth orbit. We've learned so much from the missions we've flown so far – but just think how much there is still to learn…

(29: earthrise) about our world,

(30: stars) about our universe,

(31: EMU) and about ourselves.

This is why I'm talking to you today: We achieve great things by establishing common goals, building connections instead of letting boundaries define us, and by encouraging each other – all of us – to excel.

(32: launch) I can't wait to see where we go next. Thank you!

(33: landing) for Q&A

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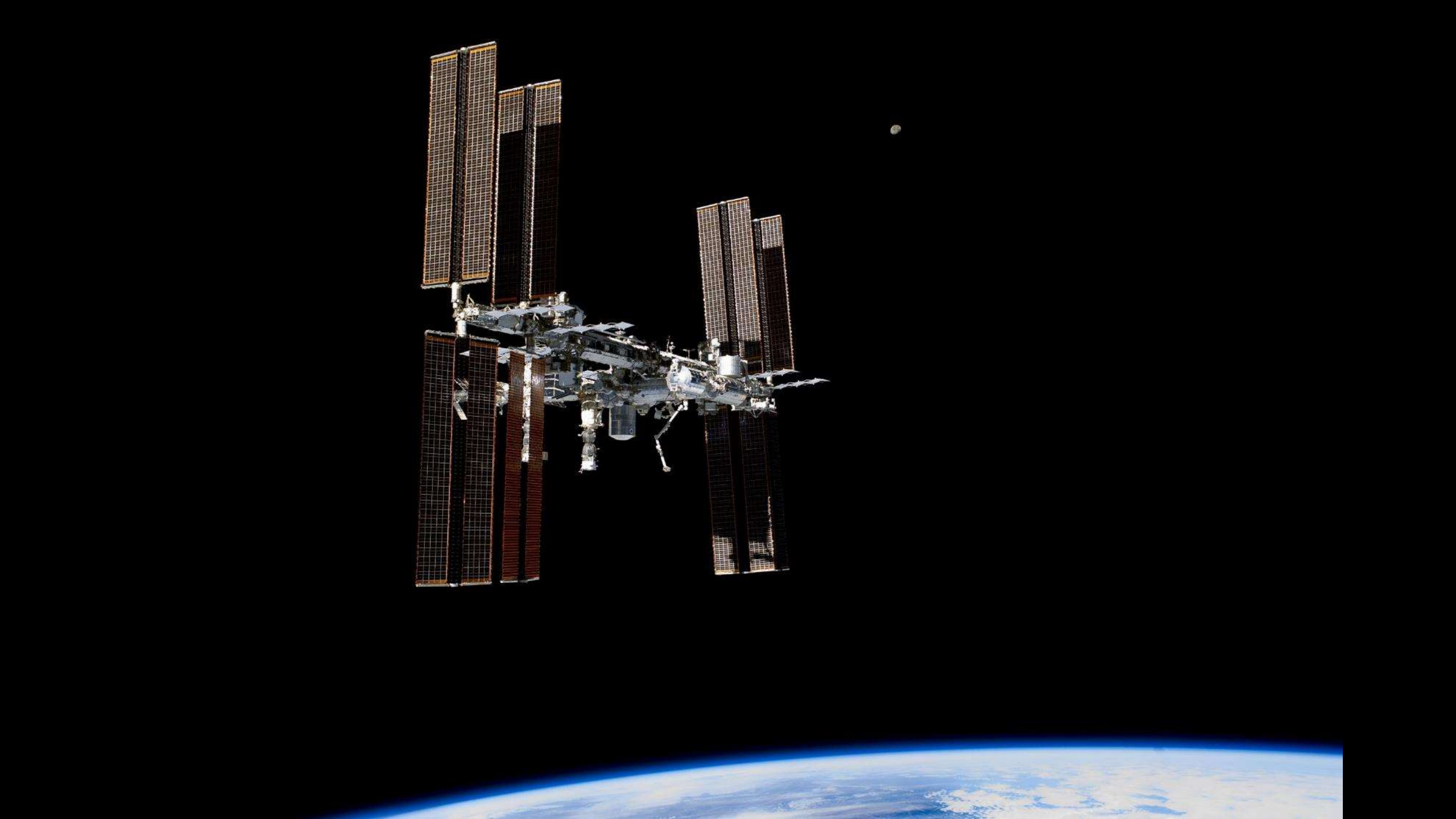


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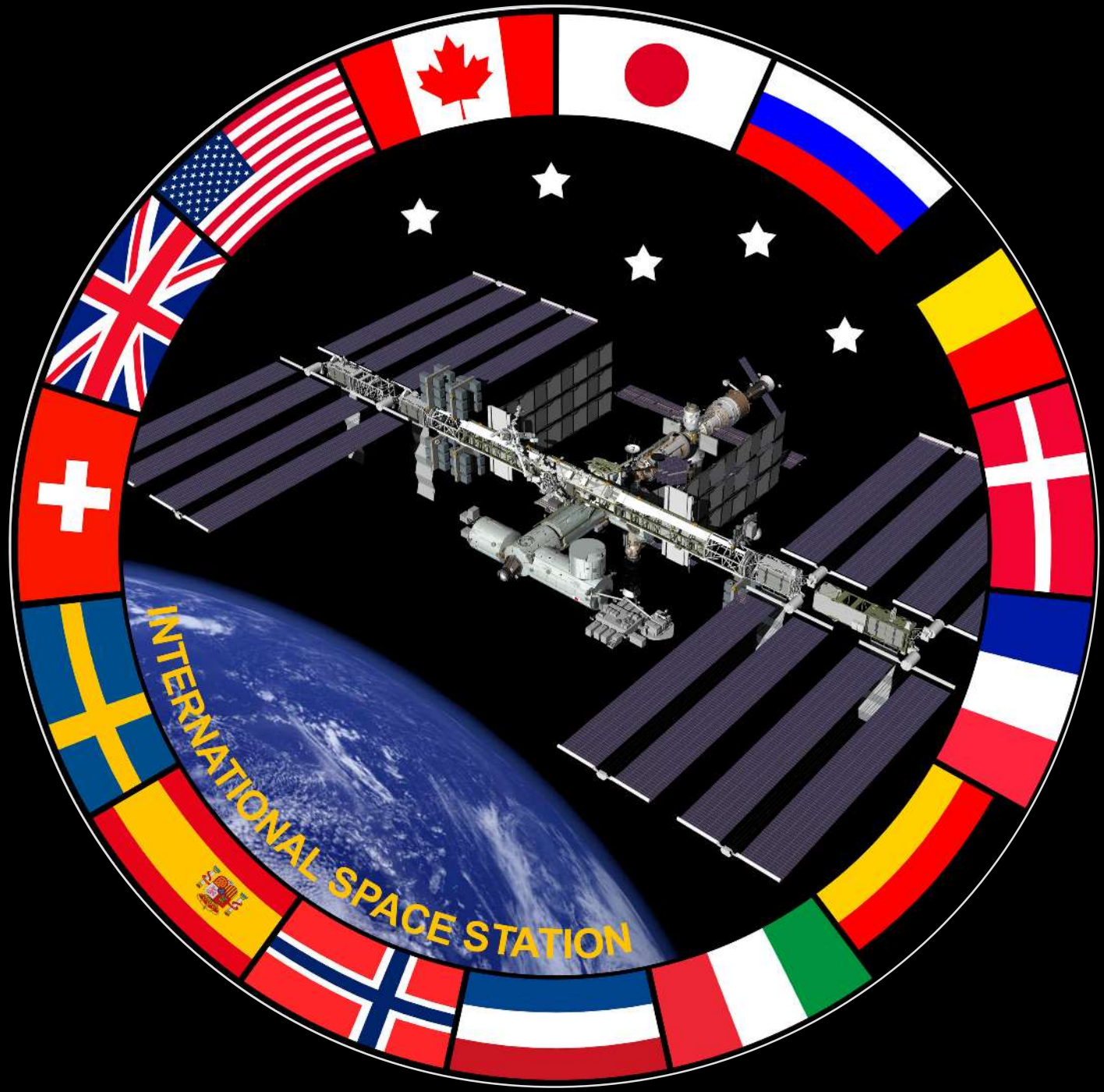
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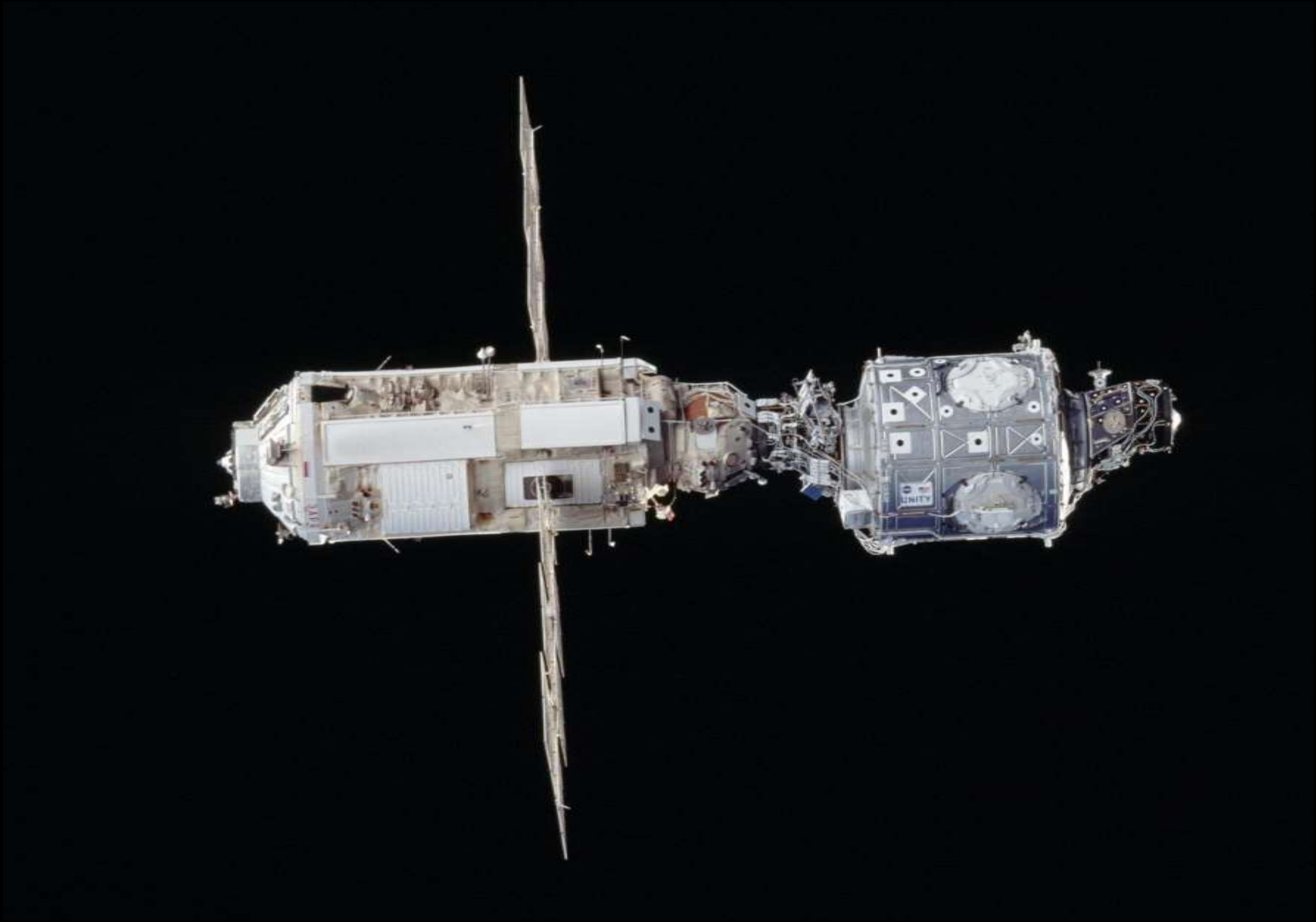
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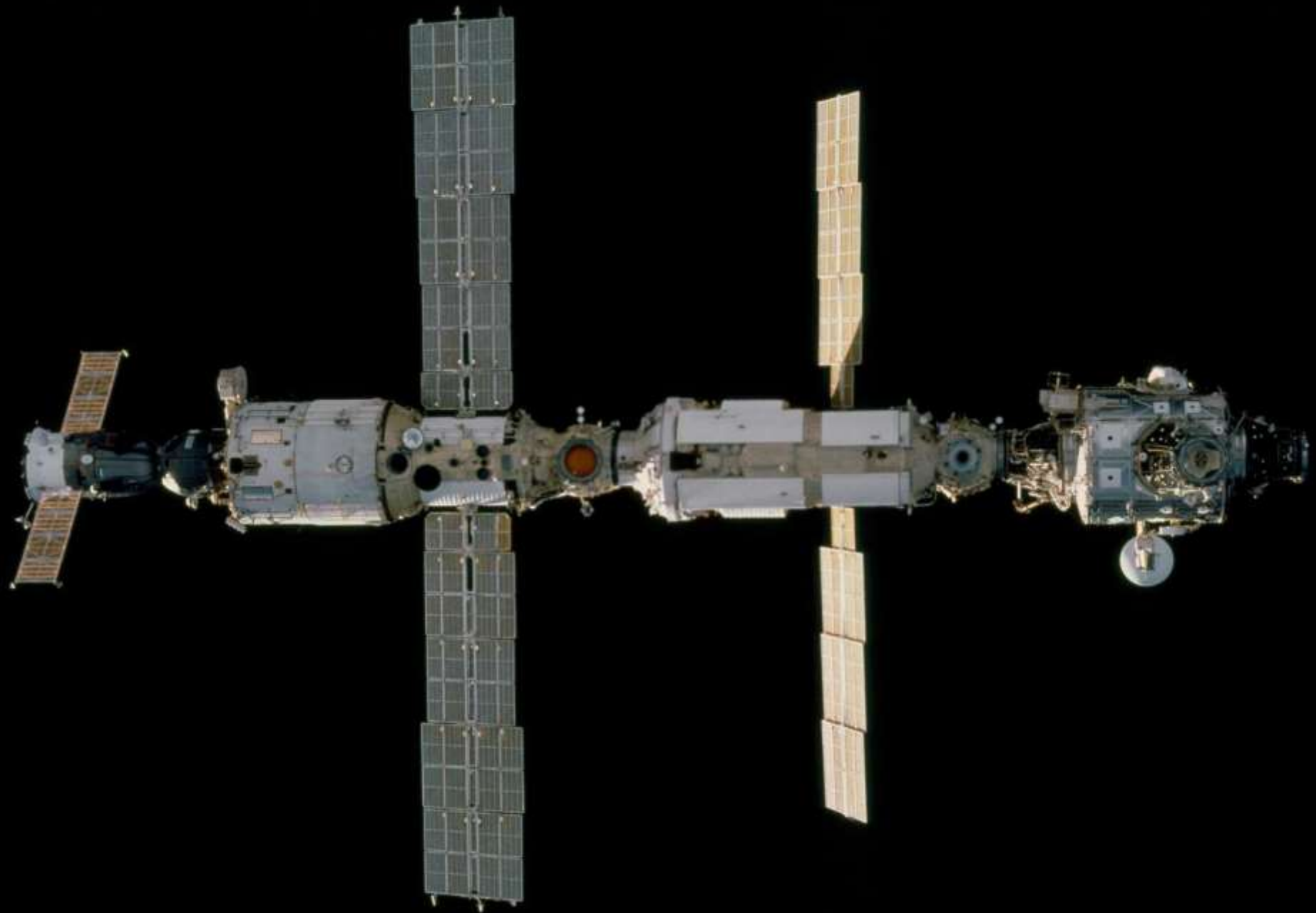


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