Preflight Interview: Leroy Chiao

The STS-92 Crew Interviews with Leroy Chiao, Mission Specialist.

Q: We're talking with Leroy Chiao of STS-92: Mission Specialist. First off, if you would, tell me why did you want to be an astronaut? Was there any particular event or person who inspired you?

A. Actually, this is something I'd wanted to do since I was about 8 years old, watching the first Apollo moon landing. I remember being in my parents' home a hot summer day watching Neil Armstrong and Buzz Aldrin touch down on the moon and then, later that evening, actually take the first steps on the moon. And to me, that was really a big event. And you know, most kids, or a lot of kids, come away with the idea they want to be astronaut. But it's something that stayed in the back of my mind all the way through college when I was studying engineering when I realized I really could do this.

Now give me an overview of your education and career, if you would. How did you get to be where you are right now?

Well, I studied chemical engineering. I received my bachelor's degree from the University of California at Berkeley and then went on to the University of California at Santa Barbara to receive my master's and doctorate's degrees, also in chemical engineering. I then started work at Hexcel Corporation in the Bay Area-in the San Francisco Bay Area-which is a composite materials supplier and moved on to the Lawrence Livermore National Laboratory, where I was doing some research work, then applied to NASA, and was invited down to an interview in December of '89 and was fortunate enough to be selected in the class of '90.

Great. Now, let's get down to this flight. You are beginning a series of missions that are involving the largest and most critical hardware for the International Space Station. If you would, discuss this flight's pivotal role in the assembly sequence and why this flight is so crucial to enabling the rest of the missions to follow.

Well, really, the flights are all kind of stacked in sequence. And it's very difficult to go out of sequence, and we're kind of next in line to bring up the next two big pieces of the space station. And what we're bringing is the Z1 Truss, which is going to mount on the Node, and also another Pressurized Mating Adapter - PMA-3, which is also going to be the primary docking port for the next flight which will be 4A.

What would you say have been the biggest challenges for you and your crewmates as you train for this flight?

Well, there are a lot of different challenges. And you know, we all have our own kind of our major areas of emphasis. For me, personally, I was the EVA lead for this flight. And so, for the last 3 years, I've been involved in the development. Even before the mission was formally assigned, I was following it. And I was working on the development of the space walks, the choreography and the tools and the hardware, you know, working with the contractors and the engineers here at JSC to make sure that we came up with hardware and procedures such that we would be able to perform these activities [during the] EVA.

You mentioned the Z1 Truss earlier. And your number 1 priority is the installation of the Z1 Integrated Truss Segment. If you would, describe the Z1 Truss in some amount of detail. How big is it? And what does it do for the ISS now and in the years to come?

Well, the Z1 Truss is basically a big cube. It's approximately 10 to 12 feet on the side. And what we're doing is, we're taking it up out of the payload bay and going to put it on the space station. And from there, the next flight is going to put the first solar array-the US solar array-on that. And what the Z1 is, it's kind of a foundation or a conduit which the power is going to flow through... it's a necessary interface to bring the power from the solar arrays into the space station.

Now, why is the Z1 Truss the first external framework for the station and can you compare the Truss to anything that we use here on Earth?

Well, as I said before...you can think of it kind of as a foundation. It serves a lot of purposes. Number one, it conditions the power that comes in from the solar arrays for use in the station. It also supplies ammonia as a cooling fluid to keep the solar arrays cool; you know, keep them in their operating temperature. And it also has the Control Moment Gyros on the back that help stabilize the space station. So, it really is multipurpose and, you know, serves many functions and is an important piece of the assembly sequence.

Give me a little more detail on the process of installing the Z1 Truss. How does that happen?

Well, Koichi Wakata's going to use the robot arm from the space shuttle, pick it up out of the payload bay, bring it over, and berth it...so it's all done robotically. We are spring-loaded to if we have to do some kind of contingency operation, to get in our space suits and go out and assist that operation. But, it's really a delicate robotic arm operation, and where Koichi's actually going to be flying the Z1 down into its final place.

What sort of additional communications will be possible after the installation of the Z1 Truss?

Well, included on the Z1 Truss...we're bringing up two antennas: the Ku-band antenna and also an S-band antenna. On the S-band antenna, we're merely kind of ferrying it up there. We're going to relocate it out of the way-out of its launch location-and then the next flight's going to pick it up and put it up on the P6 Truss in its final location. So, that's not really active during our mission. We're going to go ahead and deploy a Ku-boom antenna and get some power to it to keep the heaters on it to keep it warm and alive. But that will eventually be a big broadband antenna to send, you know, TV images and back and forth to the ground.

Now, you mentioned earlier the Control Moment Gyros. What do they do?

Well, they're big, spinning gyroscopes. Each one's about this big. There are four of them mounted on the Z1. And there, they spin at high rates of speed and they just help stabilize the space station. And it's another way of controlling the attitude of the space station, you know, either in addition to or instead of the reaction control jets.

What are the DC-to-DC Converter Units, and what do those things do?

Well, the DDCUs are DC-to-DC power converters. Basically, they condition the power coming from the solar arrays that are going to be mounted on the next mission and they're going to condition the power so that we can use it inside the space station.

Great. How would the Z1 Truss help eliminate static discharges on the station, and why do you need to do this?

Well, that's through the Plasma Contactor Units. As you bring up all the little pieces that the Z1's going to do, and I have a hard time kind of keeping them all in my head at once, too. But basically, the PCUs, they create ions. They're passing xenon gas through an electric field and create a field of ions which help kind of ground the station with its environment. And that prevents any kind of static electricity buildup on any part of the station that could possibly discharge and cause a problem.

Now, on STS-72, you performed two space walks to assess hardware and assembly techniques for the International Space Station. Now, on this flight, you're actually going to be working to help assemble the station. Tell me about your thoughts about the work that has gone on in preparing for ISS and your feelings about actually working on the soon-to-be-manned station.

Well, it's really exciting for me. Because, as you said, I performed some development work on STS-72; went out and did two space walks testing tools and construction techniques for the station. So, it's kind of neat to turn around a few years later and go up and actually put those practices into work and actually start building the space station. So, it's a real exciting time for me.

You and Bill McArthur will be doing the first and the third space walks. Tell me about the first space walk. What will you be doing?

Well, the first space walk is primarily to start the outfitting of the Z1 Truss. Once it's been berthed on to the International Space Station, Bill and I will go out the next day and begin hooking up some cables to maintain some heaters and also some power conduits. We will also be remounting a toolbox that's going to be one of two that we're going to put on the Z1 Truss that we're bringing up. We're going to be deploying the Ku boom antenna, mounting the dish on the end of the boom and then deploying that boom out. We're going to be relocating the S-band antenna, which we launch up in place and reposition for the next flight to bring it up to the P6, to its final location.

And then for the third space walk of the flight, you and Bill go back outside.

Right.

What's going to happen then?

We basically complete outfitting the Z1 or, you know, put another big chunk in there. We bring the DC-to-DC power converters up, and we're going to mount those on the Z1. We mount the other toolbox that we're bringing up with us, and kind of perform a lot of little cleanups. You know, reconfigure some cables and basically get the Z1 ready to receive the P6 Truss on the next flight.

You mentioned earlier in the interview the Pressurized Mating Adapter you're taking up there. What is PMA-3 and where is it located?

Well, PMA-3 is another Pressurized Mating Adapter. And we're going to be bringing it up and it's also going to be berthed robotically on the other side of the Node from where we're mounting Z1. That will serve as the docking port for the next mission, which is going to come up. And the orientation is such that they need to dock to that port to be able to raise P6 up and put it on top of the Z1.

Tell me a little bit more about the process of the installation of PMA-3. Give me a little more detail.

Well, again, it's a robotic operation. And Koichi is going to use his skills at flying the arm to bring it out of the bay and carefully align it with the Common Berthing Mechanism. And he's going to slowly bring those two pieces together. And we're going to have two guys- Bill - I mean, not Bill; I'm sorry - Mike Lopez-Alegria and Jeff Wisoff-are going to be EVA at the time to help be a set of eyes, two sets of eyes, to watch him bring that thing together. Kind of to give him you know, some cues about whether it looks aligned and everything. But his primary guidance is going to be provided through different means, through the SVS system. So, he'll have, you know, precise targeting cues to bring the two pieces together, and then he'll have a backup set of EVA guys there to make sure that everything looks, you know, the big picture looks good.

Yeah.

It's a very precise operation, but I think it's going to go just fine.

Tell me a little bit more about what you'll be doing during that EVA.

Well, during the EVAs that I'm not outside, I'm going to be called the IVA, the Intravehicular Activity person. And basically, I'll be conducting the space walks, kind of directing traffic out there, keeping track with the checklist of what they're doing outside-the two guys outside are doing-and kind of moving and directing them around, and replanning, as necessary, the task that, you know, that we're going to be performing that day.

Now, what kind of work goes on during the final space walk? And what are your responsibilities during that one?

Well, during the third EVA, Bill and I'll go back outside. And that's basically EVA 3 that I described, bringing up the DDCUs and mounting them on the Z1 as well as the...other toolbox that we brought with us, and then cleaning up a little bit - stowing some tools and rearranging some cables.

Okay. And what happens during the fourth and final EVA?

Well, the fourth EVA, Jeff Wisoff and Mike Lopez-Alegria will go back out. And they'll kind of complete everything on the Z1. They'll deploy the tray that comes down and get it ready for SA to berth their lab and mate the connectors from that. There's a lot of little cleanup, the photo cleanup. They want to, you know, obviously, we want to document the station, the condition of the station that we left it in to make sure that all the cables are hooked up correctly and all the, you know, all the parts are as they should be. And so, they'll be doing a lot of photo-documentation. And just really a lot of little things like that. Relocating the level. Also, at the end of that EVA, they are going to be performing a SAFER DTO, which the SAFER is a rescue device that we use... we're using on the assembly flights as well as we will use on the space station. Where if...it's kind of a mini-jet pack from where, if a crewmember becomes detached from the station, he or she can deploy this jet pack and fly back to the station. So, what they're going to be doing is performing a test of this system. And they're going to actually be doing a little bit of flying, you know, from the station down into the payload bay of the orbiter.

You mentioned earlier the Common Berthing Mechanism. What is that and is it different in any way from docking mechanisms we're familiar with from other flights?

Well, this is going to be the first use of the Common Berthing Mechanism. Of course, the pieces that were already launched up there used the Common Berthing Mechanism, but PMA-1 and -2 were mounted to the Node on the ground before they went up in space. So, this will be the first time that we actually use it in space. It's actually a pretty complex piece of equipment that is used to...mate two modules together. And so we're pretty excited about being the first ones to actually, you know, use it. And Pam's going to have the prime responsibility of operating it from inside through a computer, sending commands for the latches to engage and for the bolts to drive to bring the two pieces together.

Now what are some of the issues you face in using this thing?

Well, it's a very complex piece of equipment. And Pam's gone through a lot of training on how to use the interface to troubleshoot problems. You know, kind of anticipate potential problems and how to work around them. And it's going to be, you know, it's going to take some time for all the things to get done.

During the flight, you're ingressing into the International Space Station.

Right.

What are you going to be doing inside the International Space Station and will you be going into the Zvezda Service Module at all?

Well, we'll be going into the Node and the FGB. That's the current plan. And we'll be transferring some items, some tools, you know, small things possibly some water bags. And it's possible that we'll be called on to go into the Zvezda module. Right now, it's not in the current plan. But we've received some training so that if during the mission or even just before the mission, if it becomes part of the plan to go in there, we'll be ready.

Now our Russian partners have shown a lot of perseverance in getting us to this point in the assembly. What do you think of their contributions so far and what does our partnership entail from this point on with the future flights?

Well, they've done a good job in getting the Service Module up there. And we were all very excited to watch it dock and complete all its checkouts. So that kind of lets us kick off the rest of the assembly sequence here, starting with 1R and then our flight. So, in the future, of course, they're going to be a big part of the station. They, you know, two of the key modules were designed and built by the Russians. And they'll be our major operating partner of the space station throughout its life. So, they're obviously going to play a key role in the years to come.

Give me an overview of the role of this flight in preparing the International Space Station for the arrival of the Expedition-1 crew.

Well, this flight, what we're doing is bringing up the Z1 and the PMA-3. And what we're doing is setting the stage for future Expedition flights. Now, as the station is now, the Expedition flight could go and stay on the station. And what we're adding doesn't directly make it more habitable for them. But what it does is prepare for the next flight, for P6 to come on and put on the solar arrays, which will give them a lot more power. And then the flight after that will bring up the Destiny lab module, which will give them, you know, a large living area as well as a laboratory. So, what we're doing is kind of setting the stage for those later flights, which will directly affect the habitability of the space station.

Now, what is the importance of establishing the space station? What do you believe it will lead to in the years to come?

Well, I think a lot of the things that we talk about doing on the space station are things that you know, people have heard about: the microgravity science experiments, life science experiments. But I think the really exciting thing is kind of the unknown. You know, whenever you do exploration or scientific research you find out that you discover things that you never anticipated. And I think that's the really exciting part. You know, back in the early days when Christopher Columbus was looking for the Northwest Passage, I don't think he ever dreamed that he'd discover America and end up, you know, us ending up in just a few hundred years. I mean, look where this has led!

Yours is the 100th shuttle flight. If you would, discuss the significance of the space shuttle in human spaceflight history. Just tell me about its uniqueness, its accomplishments, and then its role in the future as well.

Well, our being on the 100th shuttle flight is kind of an interesting thing. I mean, it's a nice, round number. It's kind of like, you know, turning 25 or turning 40 or something like that. Taken in and of itself, it doesn't have a lot of, you know, significant meaning to the crew. But on the other hand, it's kind of a pause point where people-you know, including the astronauts, or people working at NASA in the space program-can kind of think about and reflect back on what has happened over the last several years. You know, it does make us stop and think about the shuttle program. And it's amazing that we've flown 100 shuttle flights, and the shuttle is going strong, and, you know, going to support the International Space Station in the years to come. And it just, it gives us a lot of pride and a lot of satisfaction to know that we're part of the team.

Greetings

Click on the image to hear Mission Specialist Leroy Chiao's greeting.

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