INTERVIEW WITH

William Gerstenmaier

BY DON COHEN

William Gerstenmaier is NASA's Associate Administrator for Space Operations. In that capacity, he directs the agency's human space exploration and oversees programs including the International Space Station and Space Shuttle. Don Cohen spoke with him at NASA Headquarters in Washington, D.C.

COHEN: Let's talk about your responsibilities and the kind of guidance you got at the beginning of your NASA career.

GERSTENMAIER: I came to NASA, to Lewis [now Glenn Research Center], in 1977 directly out of school. I was assigned a couple of mentors to work with. For me it was a great time because the folks who wrote my aerodynamics textbooks in college were the folks I was working with. Because of significant cutbacks, there hadn't been many new people hired, so they all treated me like their kid and would spend time to educate me on what was going on and help me understand what I didn't quite understand in school—I could pass the test but I couldn't quite do the real work.

They assigned me to start doing wind-tunnel tests right away. I had just come out of college and now I'm in charge of a multimillion-dollar test facility, with maybe seven technicians. For two nights I sat with someone else watching them do tunnel activities, then I was on my own. It was a tremendous responsibility, but a tremendously nurturing environment. I couldn't think of a greater place to start my career. The folks wanted to make sure I really understood; they really challenged me. They gave me top-notch tough jobs to do and let me work as hard as I wanted to. Also, being in testing was very good. When you put something in the wind tunnel, you did your own analysis, putting the probe in if you're going to measure the flow behind the model, for example. You had to do your own stress calculations, your own safety report. That was a scary experience because if this little probe breaks off and goes into the turbine

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at the end of the tunnel, I'll have caused a multimillion-dollar mishap. I would do all the calculations, then I'd find three or four engineers who had done this before and say, "Would you make sure that I really did this right because I don't want to mess something up?" I had lots of responsibility, yet I could really learn. So I gained a ton of firsthand experience, a lot of detailed engineering stuff, and even management skills, managing these technicians in the evenings when we were running the tunnel, keeping people on schedule, keeping things moving.

COHEN: Do recent NASA hires have anything like that kind of opportunity?

GERSTENMAIER: Today, we have to contract out, and things are a little bit slower. At Lewis we had a fabrication shop, where we made wind-tunnel models, and an instrumentation shop, all run by civil servants. I didn't have to contract out to procure a piece. I could do a design on my desk, take it to the machine shop, have it machined that afternoon, and have it in the wind tunnel that night. In operations today, new engineers can go in the control center; they can learn from experienced people and get the same nurturing that I was able to get. NASA still gives us a pretty good chance to learn. I think the test environment is a great place to start because you get a lot of hands-on experience. In school you get the academics, you understand the theory, the calculations; you understand how to run the computer code. When you're actually doing the testing, you get to see how it works in the real world.

COHEN: Did you get mentoring in management as well as technical mentoring?

GERSTENMAIER: At the research center, the focus was on technical excellence. Managing and project management skills at that time were not stressed. We were pushing the state of the art of technology; we were writing peer-reviewed papers.

The things that were really valued were technical excellence and the research side. I had a new employee individual development plan, much like we do today. Each year I got reviewed to make sure I was moving forward. I think what was even more valuable than the plan was the fact that the personnel there took an unbelievable amount of time to help me learn.

COHEN: What came next in your career?

GERSTENMAIER: In 1980, I got called by Steve Bales at the Johnson Space Center. They wanted someone with propulsion experience, which I had from Cleveland. I went down to Houston and sat on console for the first roughly sixteen shuttle flights. I was in the back room for the first shuttle flight, STS-1.

COHEN: What was the environment like there, compared with Lewis?

GERSTENMAIER: Very different. Johnson was very competitive; people competed to get on console in a certain position. Growing and learning happened, but you had to do it yourself. I was in a very competitive group, the propulsion group. I tried to pick areas other people didn't like, so I worked in the thermal area, the electrical area, and computer software. I got to write a lot of the detailed test objectives that were done on the early shuttle program to show how the shuttle performs in various attitudes, pointing at the sun, getting hot and cold. I also got to understand how the software works to control thrusters and guidance, navigation, and control. I did rendezvous procedures. I learned a ton in Houston, but it was a different kind of learning. You had to be more of a self-starter. It was a competitive environment that forced me to be at the top of my game and keep pushing my ability to perform, execute, and deliver to new levels. Then I became a section head in '84 or '85, in charge of the payload section. We were responsible for all the payloads that were deployed by the shuttle arm. The Hubble Space Telescope, the Spartan payloads were managed by our section. That was a hard transition, to go from the technical world to the management world. Frankly, it's even uncomfortable for me today. I still very much like the technical stuff, understanding the detail of how things work. The softer people-management skills are mandatory and critical in my job now, but my passion is still the technical piece. Then I got assigned to a project called the Orbital Maneuvering Vehicle project, which was to be a space tug that would grab things out of geosynchronous orbit and bring them down for servicing. It was a chance for me to set up an entire operations organization from scratch. That was a tremendous organizational-management experience. That then got canceled.

COHEN: I'd like to hear about your space station experience.

GERSTENMAIER: Initially, it was going to be assembled totally on orbit. The truss was so long you couldn't fly it up in pieces. That approach got canceled. Then we found out because we had shrunk the truss size so much, we could fly it up in preintegrated pieces. We could build trailer-size pieces and plug them together. I was in charge of the group that laid out all the operations concepts and processes to build the station.

COHEN: This was before the Russian involvement?

GERSTENMAIER: In 1992, I left NASA to work on a PhD. That's when they brought the Russians in and space station went through another redesign effort to bring in the international partners. When I came back to NASA, the propulsion systems were gone; they're given to the Russians. Some of the attitude control systems were given to the Russians, with U.S. [responsible for] control-moment gyros; some of the life-support systems were given to the Russians. But the basic concept was there; 90 percent of the station was still the same.

COHEN: How did you learn to work with the Russians?

GERSTENMAIER: I went to Russia in '95 and '96, when Shannon Lucid was on Mir. I was her ground person. I was the first American to go to Russia as an ops lead in charge of her science program and stay there for an extended period of time. Prior to that, folks would come for a couple of weeks, then they would go back to the U.S. and another person would come. I was the first person that stayed the entire time (approximately six months). And because I had background on shuttle and station and propulsion, I wasn't the typical science person that's fresh out of school. I actually had a lot of

experience in short-duration spaceflight that the Russians were not used to seeing. I had to negotiate the contract with the Russians for the program I was going to have to implement—phase 1 operations.

COHEN: Was that a hard negotiation?

GERSTENMAIER: It was tremendously hard, but it was good because I knew what was possible and what wasn't. I got requests from the U.S. and NASA to negotiate things that were physically not possible, like more communication time than was available because of the satellites and ground stations they have. We could never achieve that capability. So I immediately took those things out. The Russians had never seen anyone who would just drop stuff because it's not technically feasible. They weren't used to having someone on the other side of the table who was knowledgeable enough. It was a hard negotiation, but it was good. I got accepted into their control center just like a Russian flight controller.

I established a relationship with the Russians. They'd be doing a telecon with the Americans and I would be sitting in the back of the room while the Americans were negotiating a position with the Russians. And they would go to me and say, "This is crazy. You know we can't do this." I actually got to see what a NASA-American looks like to a Russian through their cultural eyes. Later I became deputy program manager for space station, working with the same Russians. I know these folks personally; I've worked with them; I lived in their country. They know me. I know their culture.

COHEN: Do you think it should be a rule of international cooperation that someone actually be there?

GERSTENMAIER: I don't know that it's mandatory, but you really have to have that cultural appreciation because the cultures are so different. You either need to be very intuitive and perceptive and be able to accept and understand those differences or you have to have some experience.

COHEN: Are there lessons from space station that NASA needs to take to heart?

GERSTENMAIER: Cooperation will be important in the future. Because of the cost and complexity of space missions, it's difficult for any nation to do them alone. During Apollo, we got to the moon a lot faster because our goal was to beat the Russians and show our prowess. Station is very different, a cooperative activity. I think cooperation will have much-longer-lasting results, but it may take longer to achieve your goals. Having the Russians around after *Columbia*, when we had no ability to transport our own crew to the station, kept our crews on station. And the Russians learn a lot from us.

COHEN: For instance?

GERSTENMAIER: During their spacewalks they typically wouldn't work during the night passes because they didn't have lights on their spacesuits. They were able to adapt their spacesuits to use our lights. We also carry a helmet camera so we can see what the astronauts are doing. We've adapted our helmet camera to work on Russian spacesuits so now they use our lights and our cameras on spacewalks. We use a lot of Russian wire ties: those little copper things that tie down cables. We have a body-restraint tether which holds the spacesuit fixed in one position. The Russians are using that now. So there's been a tremendous amount of learning on both sides. I think that's the wave of the future.

COHEN: The space station lessons you describe are all examples of people seeing something in action, not reading a report about it.

GERSTENMAIER: I think internationally that works better. The cultures are so different that if I just gave them a report, they wouldn't understand it with the same cultural mind-set that I have. But when you physically see it work, you see it through your own cultural lens and your own activity so adaptation and absorption are quicker. In diverse cultural environments, demonstrating a capability is more effective than academic proof that a concept or a device works.

COHEN: Maybe the same holds true between NASA centers and NASA and contractors, which are somewhat different culturally.

GERSTENMAIER: I agree, because we all carry our own biases based on our own experiences. But if something is demonstrated to you and you can perceive it through your own lenses and filters, you can judge for yourself whether it's valuable or not.

Also, dependence drives learning: I need you to do this component because

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I don't have the resources to do it. That builds a much stronger tie. If you have your own capability and they have their own capability, you can cooperate in space but not really get that learning. Before *Columbia* occurred, we used to test our own air and water samples on station and the Russians did theirs. Russian and American air and water specialists didn't have to interact. When we lost *Columbia*, we had no way to return our samples. We had to bring our specialists to Russia to see how they analyzed air and water. That forced a deeper cooperation than would have been there if we were not interdependent. So when you think about doing a project, where you choose somebody to be in the critical path or where you're going to be dependent upon them needs to be a very strong strategic decision because that will drive learning and technology. You should consciously think about where you put those dependencies in. It's not appropriate for you both to have full capability. That's essentially two programs running in parallel, which is not effective.

COHEN: From what you're describing, it sounds like you need trust to work together, but trust comes from working together.

GERSTENMAIER: We had almost ten years of working with the Russians before *Columbia*. When *Columbia* occurred, we were going to have to use the Soyuz on a routine basis. But you couldn't immediately have gone to that dependence and interaction without some lower-level, non-risky interaction that built confidence before the crisis. You almost have to stage the relationship such that you learn and gain this trust. Now we have a very strong relationship with the Russians. We do [also] with the Europeans, the Japanese, and the Canadians. We can use the space station partnership to leverage even more challenging, more dependent things for exploration as we think about going beyond low-Earth orbit.

COHEN: The process you describe—working together to develop trust, facing crises that will make or break the relationships—sounds a lot like marriage.

GERSTENMAIER: I think that's life in general. In a very stressful situation, that external stimulus either drives you closer together as a team or you splinter apart. The key is to figure out what drives people together—people in combat situations, people in extremely stressful situations—what builds team cohesion under challenges, because the challenges will come. How do you as a program/project manager think about how to build this underlying environment such that

when the stress comes the team actually gets driven together?

COHEN: We're talking a few days before the new NASA budget is announced. What do you think some of the challenges posed by the new budget will be?

GERSTENMAIER: What I've learned throughout my NASA career is that, as a program/project manager, you have to have some streak of optimism or you would have quit a long time ago. You've got this impossible schedule: you're given three years to build something. You can never plan a project totally and understand all the details, so there has to be something in you that's eternally optimistic. They talk about it as "realistic optimism." Another thing I learned from the Russians: they always have the goal in mind. They may take the most circuitous route to that goal you could ever imagine, but they are 100 percent focused on that goal. They are going to get there no matter what. So, back to NASA: I don't know exactly what is going to come, but I have an optimism that we're going to do something very productive in the future, pushing technology, giving challenges to students to learn science, technology, engineering, and math. I think NASA can provide that excitement for students. What specific things we'll be working on, I don't know at this point. We're blessed in this country; we're given a pretty good portion of the budget. Even though it's only seven-tenths of a percent, it's still big compared to what other countries get. We have the ability to do a lot of technology and explore and work with industry. I think we've got enough tools so that when we're given whatever the plan is, we'll figure out a way to craft a program that will be exciting and innovative and invigorating for students and other folks in the future. I don't know the specifics, but I've been through a lot in my thirty years with NASA. If you roll with the punches and deal with what you've got, you can make some amazing things.

COHEN: Do you think the NASA spirit has been essentially the same over all those years?

GERSTENMAIER: I think so. Look at station. Station is a miracle. At those first reviews, when we were looking at building the truss in space, I said, "This thing is never going to get built." Then we got directed to go preintegrated truss and figured out how to do that. Then we're adding the Russians; they're taking away all these critical systems. That should be the end of the world; that's never going to work. But now we've got 850,000 lbs. in low-Earth orbit with all these international partners; we've got control centers in Japan, in Russia, Europe, and Canada all supporting space station. Looking forward, I'd say it's going to look momentarily tough, but if you just keep chugging away with that perseverance and that little bit of optimism, it's amazing what these teams can do at NASA. The folks here are phenomenal. We had the external tank problem—6,000 dings on the tank—and they came to me and told me they wanted to repair this tank, I thought, "No way," but I saw that spirit in their hearts. They said, "We can do this." Lo and behold, they got this tank ready to fly and it worked out extremely well. I see that same thing now. We'll be given something that looks impossible; that's okay. Dissect it, parse it down into small pieces, and we'll make something out of what we get. It's a good time.