4-9-2011

Interview with David Lee Hansen

David Lee Hansen
Utah State University

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I am Sarah Fassaman. I am here with David Hansen, and we are at the Riverwoods Conference Center in Logan, Utah. It is April 9th, 2011. Please state your name and your birth date and birthplace?

My name is David Hansen – full name David Lee Hansen. I was born in Salt Lake City, Utah May 16th, 1971.

Okay, so as a child was there anything that got you interested in space exploration?

Yes, yeah, definitely, I have always loves anything to do with aerospace, aviation, and all of that. Mostly, like I was telling you yesterday, my brother and my father were always kind of tinkering with remote-control airplanes and models, and telescopes and that sort of thing. I was the youngest kind of tagging along. My brother could understand most of it and kind of get involved and play with my dad and I would be watching and helping out a little bit. I just yearned to be able to do everything they were doing, so I think that that passion just stuck with me.

Obviously, you were really interested in aerospace. Was there anything about Utah State that drew you to it?

Yes, I was in high school and I was pretty young at the time and I just remember I would build models—airplane models, rocket ship models, even sci-fi kind of stuff—and enjoyed that. I followed anything that NASA was doing, anything that was in the news, anything that was happening around the state with Thiokol and so forth. Anyway, I just remember one night sitting in front of the TV and there was a report about the Get Away Special Program—you know Logan, Utah, Utah State University, this week they are flying these experiments, which I thought was really cool, but nothing I thought I would ever be involved in until they said these are student experiments—regular college students. They designed and built these experiments and they are flying them. And, I don’t know why, but from that moment on I just became enamored with the idea and the program and I knew if I had any chance to get to Utah State University and be in that program I was going to do it. I didn’t really talk about it a lot, I just knew that was the direction I was going to go. I was amazed when I got here and there wasn’t any test you had to take or have so high of a GPA, or you had to be a Junior or something to get into the program, you could just walk in. Which is what happened—I walked in, it was the summer of 1995. I didn’t start fall quarter, I got up here in the summer, and I walked in and Raghu Tumkur was sitting there at his desk and we started talking. I was really nervous, thinking I really want to have a good rapport with this guy, and hopefully he will kind of help me to qualify. So with some trepidation, after about five minutes of talking with him I said, so Raghu, what do I have to do to be in this program? He said, well, you’re in! I was just dumbfounded. What! Really! That is where my beginnings had its root and where it really got off the ground. That is the story!

Do you remember that summer what Raghu was working on? Did you get involved right away?
Well, let’s see it was G254. They had just launched that I think about a year before. They were still kind of going through a lessons-learned mode, you know—these are the things that worked and these are the things that didn’t. Now for the next launch we want to improve such and such. So that was kind of the mind-set at that point in time in the GAS program. The next launch was going to be about a year away and was G200 (I had to double-check yesterday with my buddies, you know, what was the numbers? Which launch was it? When did it happen?) Because it has been a lot of years, but I was on G200 Water Polarization Experiment, which I inherited from Jeff Humphries, who had inherited it from someone before him. Raghu was the coordinator and just kind of getting everybody on the same page of music and ramping up to start building the experiments and get ready for testing and what are we going to put on the next launch. That is kind of where they were.

You worked on Water Polarization?

Water Polarization, yes.

Could you talk a little bit more about that?

Yes, water polarization, it is kind of an interesting and sad story in some ways because—no it is not a sad story, it is a great story, great for me. I got a lot of benefit out of it. But Jeff Humphries, he had the experiment before me. He designed it—well with the help of his predecessor who kind of introduced him to it. Anyway, they built the experiment—it was ready to fly, but I don’t know exactly what was going on—possibly some personality conflicts, I am not sure because I really was not involved at that point. But Jeff Humphries’ experiment got bumped. It did not fly. He was pretty disappointed about that. But he got a lot of good experience and he asked me if I would be interested. I was kind of looking for an experiment to either help with or lead and water polarization was sitting there. No one had picked it up and started running with it. So I did. I was just lucky. Someone had done the work—most of it. It was just sitting there; it just needed to be reconfigured for the next launch. It seemed like a good opportunity, so I jumped at it. Water polarization, basically you have a droplet of water and you create a positive and negative field. You have two plates that are charged and it pulls the water apart. At lower voltages it just deforms it and at high enough voltage levels it breaks it apart. It is very well understood exactly what is happening to the water droplet on Earth and what voltages cause what deformations and at what point will it break apart. In zero-G or microgravity we have no idea what happens. So it didn’t get to fly, so I was going to fly it. As I recall, we couldn’t fly his exact experiment in the new structure. We had a new case—isogrid and so forth, and so we rebuilt several pieces and we thought we were going to be making some improvements also, like with the camera, and anyway we rebuilt it and it did fly. It flew on G200, which flew on STS-77 in May 1996 I believe. I was lucky enough to be at the launch. That was a fantastic experience.

So what were the results of the experiment?

That was another one of the—it is almost like a soap opera—so and so has this great idea and they can’t fly so they pass it on to the next guy and he works on it but it can’t fly, and it finally does fly and the camera breaks. That is what happened. Everything that we designed worked. I was a mechanical engineer—I was studying at that time and that was my major. We designed a chamber; we did all of the pieces of the system. We tested it and it worked. The one piece of the equipment that was off the shelf, the only real major piece of equipment that was purchased right off the shelf and used was a camera. Back then it was 8 mm regular film. Well, it jammed on the first frame. So we get the film back and we have it developed and the first frame is just over exposed and there is nothing on anything else. So we were able to tell that yes, the voltage went up as predicted, there was a syringe that was—there was an accelerometer—no a linear actuator,
that pressed just enough water—one cc of water—to make the water droplet. Anyway, it all worked. The only thing that didn’t was the camera. We just couldn’t see what happened. And that was our only real data collection device aside from just the, did this step work? Yes or No. Did this step work? Yes or no—you know that kind of diagnostics. We could tell that it worked but the real data that we wanted was lost.

*That is really sad.*

Yes, it is very. And I hope that someday that experiment—somebody gets to fly it and gets good data, because people are still waiting for that information.

*But you did get to go to the Shuttle launch.*

Oh yes, it was, like I told you yesterday, the launch was—I didn’t know what to expect. I mean, I knew we were going to watch the Shuttle launch, but what we were going to be, you know would we go on tours, were we going to get to see in the vehicle assembly building, what were we going to do when we got there. What was the launch really going to be like? It was just like a kid in a candy store. The launch was unforgettable. It was an early morning launch—it was just gorgeous. I had friends there right next to me—we were all—everybody that had worked for a year on this project were waiting for it to go up and just the anticipation of it was—it is really hard to describe. I always try to emulate what we had in the real world right now, you know in business. If I am on a team that even feels a little bit like that GAS team I know it is going to be great. We are going to get great results. We are going to do great work, we are just going to really excel. It has just become kind of like a touchstone for me—a barometer—internally it is just, I think subconsciously I measure my team experiences with that as a backdrop. That team and that GAS experience was so good. The interpersonal relationships, and I am not meaning just socially, but when you are on a GAS team you are not just brainstorming with people who have similar backgrounds. In the real world, you know in a lot of corporations you will be an engineer with a bunch of other engineers, and you will be brainstorming on a system and you come up with some pretty good ideas, but in the GAS program you are brainstorming with people from all—you know other students that come from well electrical engineering, mechanical engineering, physics, math, even business. We had some history majors—my wife was involved in some of the discussions and you just can draw upon a much deeper well of knowledge when you do that. It is such an informal kind of a setting you just have this freedom—you know nothing is off limits. You can propose the craziest ideas and you can’t get fired, you are not going to lose a scholarship or anything. You can just enjoy that freedom. You come up with some really great solutions that I don’t think you can find in most traditional groups. That was one of the biggest take aways that I benefited from by being a GAS student.

*Did you guys drive to Florida to see the launch?*

No, that was another lessons learned. On 254, they did that. They drove down to Florida. I was talking to Casey Hatch yesterday. He is a good friend and a great GAS student—almost a legend in his own right—anyway he was telling us about the trip. He could not even sleep at night because of the humidity. They were camping out. Just to save money they all drove. It was just a miserable experience—I mean it was a wonderful experience for them all, but the logistics and the living conditions with that many people for that much time, and when you get to the shuttle launch you don’t know if they are going to launch today, tomorrow, or next week. So you don’t know how long you are going to be camping out. They decided, and I am glad they did, it’s going to be much better if we just fly and get a hotel. That is really the way to go. So I benefited from that lesson. It was comfortable and as I recall, I may be mistaken, but I believe the launch was delayed and we ended up having to stay a little bit longer. So I am glad we were not camping with the alligators.
I know we talked about not recreating our conversations from yesterday, but I really enjoyed listened to your experience watching the launch.

The launch—anyone who has been to a launch—boy there is actually a lot I could say on this. The Shuttle, when you see it light up. I brought a camera with me to the launch—an old SLR and years from now people will be listening to this and think what the heck is that—but it had a little light meter in it. So I wanted to get a picture of it right when they lit the engines. It was an early morning launch. The sun hadn’t come up yet so it was still pretty dark and we could—you are far away from the pad, you can’t—the day before we got to go right up to the pad which was great. The whole thing. But when they are actually doing the launch no one is even close to the launch pad—it is just too dangerous. So we were, I think, 4 miles away. You are thinking, man I am not going to really be able to see anything. There is that tiny speck way off in the distance that is the shuttle. I can kind of tell it is the shuttle but it is really far away—you need a telephoto lens or a telescope to really see any detail. So I was worried that I was going to be—you know my expectations were not going to be met, and I was kind of bracing myself for that because for years I had been dreaming of this and I didn’t want to be disappointed, so I tried to temper my enthusiasm. But when the engines lit my light meter just went off the scale—literally, it did. It just went off the scale. It is so bright. It just lights up everything like it is the middle of day. Then the rumble hits you. You hear it, obviously. It is loud, but you feel it more than you hear it. The ground is shaking—I remember seeing alligators out there that we didn’t even know were there. As soon as the ground starts shaking they start thrashing around. Their tails are flipping, they are freaking out. We are like—Wow, look at all those alligators. But we were more interested in watching the shuttle, obviously. But you feel it. It goes through your whole body. The energy just shakes you. It is almost like being at a concert next to the speakers. Your body is vibrating. The ground is vibrating, and you become—you realize you are not really distant from this experience. You are really attached to the event—it sucks you in. There is just no way to describe it. Your senses are just heightened. Not to get too flowering about it, but it is stamped in your memory, it is burned in your memory the first time you are able to experience something like that. The energy that is released is awe-inspiring.

That is cool.

I can tell you about the plume if you want. I know you enjoyed that. It was really cool. You are expecting it this launch to hear some noise, see it go up, and you are done, but suddenly when the ground is shaking and you feel like you are right next to the thing. You know if you shut your eyes and you didn’t know what was going on you would really be worried that something right next to you was just about to rip you apart. There is so much energy, you feel like you are right next to it. So that coupled with the beauty of seeing the shuttle rise up into the air from a distance you are thinking, man, I thought it would be going much faster, but it gives you time to really enjoy the experience, really savor it. I was really lucky to be able to have the launch happen at that time of day because the sun hadn’t come up yet and so we were in shadow. The Shuttle is in shadow until it gets up there 300 or 400 feet and then suddenly it hits the sunlight and it is that low sunlight that is golden before the sun gets too high. So it was just this plume going up that you are following that is in the shadow that is silvery then it hits the sunlight and the shuttle and the plume turns to gold. I just remember thinking when it was all done the whole experience was way, way better than my greatest expectation. It was just something that I could never forget, something that I still to this day stop and think about, Wow that was some experience. I wish I could go and do that again.

Have your experiences in the GAS team helped you in your current position?

Well, yes, in many ways. I told you already about that team experience. You take it for granted when you are a GAS student, and hopefully the GAS program will always have that flavor, that one quality of anyone being able to jump in and get their hands dirty. To be able to get on a
team, hopefully of their choice, I mean, I am speaking idealistically here. I know that you can’t always have the perfect environment, but I feel like I had the perfect environment. I was able to jump in, choose an experiment that I wanted to do, have a wonderful team, and there is no—I have got to say, it is a double-edged sword, the finances of the GAS program because we had almost no money, and most of the money we got—I think we got $5000/year, and sometimes probably less than that—maybe zero. Most of that money went to buying space on the Shuttle. I think it was $3000-$5000 for a can, depending on the size. So most of the money went into buying the can, the space, the ride on the shuttle. There were some scholarships and so forth and I think they may have come from other sources, but essentially we had next to nothing when it came to money, which was a problem, but it was also a blessing because we needed to go scrounge. We had to approach businesses, we had to network, we had to do some research and find out, you know for our controller we could use this device, this device, or this device—which one is better. Then we had to go talk to those companies, which translates in the real world as very useful experience and a skill set that is very desirable. So, the other benefit of having kind of a low budget is that you are under the radar. You don’t have the department head, who was actually a big supporter of us, or the University president, or any real political powers that could change things. They just were not interested. It was not that big of a deal to them. There wasn’t a lot of money that was being—they didn’t feel really vested. They knew about what we were doing and they thought it was interesting and the University always benefited from being able to say we have done more experiments in space than any other University and so forth, so it is a double-edged sword. You don’t have the money, but at the same time because you don’t have the money you are insulated and you have freedom to have these teams where you can come up with any idea that you want—really think outside the box—without any fear of having to run this by so and so and will the dean or the president or someone nix that idea. That stifling effect of what is someone else going to think or what is some higher-up going to do if I present this idea. That is removed from the equation and you end up with a team and an experience—a way of doing your business, doing your experiments and educating GAS students that I don’t know how you could get in any other way. So I am glad that there is more money coming toward the GAS program, and I am not sure how you can preserve that element, but I think it is one of the greatest benefits that I took away from the GAS program was that freedom and that experience of being able to say this is the way a team really should work. This is the way you come up with the best solutions, and just a whole mind-set of how to approach problems was very optimistic. There was always a lot of mutual respect and when someone made a comment that was, even if we didn’t use it, nobody ever felt like embarrassed. It was really wonderful.

That’s cool. Do you have anything else you would like to add?

Boy, yes, I think I would, and I guess history will bear out whether or not this is important or not, but I have always loved NASA. Growing up NASA was kind of this ideal, this wonderful organization that can do anything. When you get into the GAS program you start realizing that you know they put restrictions and they put these specs together that you have to meet which are good in a way—really good actually because it protects you from yourself, it protects the orbiter—the Shuttle at that time—but it is really kind of overdone, in my opinion. Like the batteries, the batteries had to be in these pressurized, these enclosures that you could put a bomb in there and it is not going to rupture, but the batteries that they would allow us to use were really, and the only ones that were allowed, were really dated—you know lead acid batteries. There were much better batteries that we could have used that would have been a lot smaller, a lot lighter. This is just a jumping off point to the real point I want to make, but I kind of got a little big, not jaded, but disillusioned about NASA when I was working with the GAS program. They were really interested in the non-science things that went into the GAS cans—the popcorn and so forth, which I totally appreciate. I am really glad that the elementary school kids get that experience. I would never want to take that away, but NASA—that is what they were interested in. We would come up with other experiments and solutions to problems and they were just disinterested. They just didn’t care. They just wanted to make sure we met the specs. I had an
experience—I was able to talk for several hours once in a real intimate sort of setting with Gene Kranz—he was the flight director on Apollo 13, you know the whole Apollo program, before and after. He was one of the big dogs at NASA and I have a lot of respect for him and that whole generation. He said to me once, you know during Apollo 13, when they started having the problems and they were still trying to figure out what to do, he said for sure any resource NASA had was at his disposal. He would not have to ask twice. It was available; he had assured knowledge that that was the case. Anything he needed he would have. This was 10 years ago at least when I had this conversation with him. He said after we landed on the moon and after the space race was over, everything changed. He was really kind of disappointed. He still loved NASA and he stayed with NASA for many years after that. I don’t want to say that NASA doesn’t do great things, but it seems like they are so busy justifying their existence with Congress that the drive, the innovation, the effectiveness of doing real science and being able to really, you know, change the world and move humanity to the next step—I don’t know if that is really a desire that NASA still has or if they are even capable of doing it anymore. So, like I said, I think that is a harsher criticism, but it is really my viewpoint and I think it is something that should not be swept under the rug.

Thank you. Is there anything else you would like to add? Is that it?

No, I think that is it. Thanks for letting me ramble.

I appreciate it—I think we have some good information.