NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

JOHN H. BOYNTON AND LLOYD SWENSON
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is June 16th, 2009. This oral history session is with John Boynton, who has provided information for the project earlier this year on March 5th and March 19th. He is joined today by his friend Loyd Swenson, who is the author of several NASA program histories, including *This New Ocean* and *Chariots for Apollo*. So we welcome both of you as a former employee of JSC and a longtime and always historian of the space program. We thank you both for coming in today.

SWENSON: And a contractor.

WRIGHT: And a contractor. Always glad to hear. If you could just start for us today, John, and just give us a brief background how you two became not only friends but associates in the space agency.

BOYNTON: Well, Loyd of course interviewed a bunch of people right after Mercury, because he wrote *This New Ocean*. I was one of the people he interviewed because I could actually talk. Some of those guys weren't very good at explaining what they were doing. So Loyd spent a lot of time with me. He used some of my stuff in his history, I hope. But then he came back and interviewed me in 1970, which I'd forgotten. You gave me the transcript for that. But he did

interview me after Apollo 11. But the interesting thing is Loyd started a group called Archimedeans. It's people that got together some evening and talked on into the night.

SWENSON: Town and gown group in big city.

BOYNTON: It was a bunch of pseudointellectuals, people who thought they were smart and they could cover all the problems of the world. After Archimedeans, we just remained friends. But I have an enormous respect for Loyd and his storehouse of knowledge. He just knows ten times as much as I do. But he's a wonderful historian, and he certainly is interested in space. So we've always had a lot to talk about.

SWENSON: In the back of the Mercury history, there are 214 interviews. Boynton is number 19. It's just alphabetical listing.

WRIGHT: While you have the book in your hand, can you share with us some thoughts about when you did those transcripts and how that introduced you to so many people associated with that program?

SWENSON: I'd just come out of the Navy. Went to graduate school at Claremont [College] in California and discovered, there in the library, history of science as a profession. That was a eureka experience for sure. I knew that something was wrong with our society and that the best bridge between the two cultures, as C. P. Snow talked about it, between the science engineering culture and the literary legal humanistic political culture, was history of science. But I wasn't fully clued

into history of technology yet. Didn't quite realize how they'd grown and developed in their own ways. History of science is very much intellectual history. Very much philosophical orientation. History of technology very much economic history, patent law, innovation, design science and that sort of thing.

So after I finished a dissertation in the history of science, the primary experiment behind [Albert] Einstein and special relativity, it was the [President Dwight D.] Eisenhower recession. Couldn't find a job. Went all over the country. Resumes everywhere. Finally, at the last moment, I heard from a friend here in Houston, whence I'd come as an undergraduate at Rice [Institute, now University], that the University of Houston has a brand-new contract with the Manned Spacecraft Center [MSC], which used to be the Space Task Group coming out of [Hampton] Virginia, [Langley Research Center] relocating in Houston, to research and write a history of Project Mercury. Would I be interested? I said, "I'm your man." Because of the history of science background and the fact that I never quite made up my mind what to major in as an undergraduate, whether it should be science and technology of one sort or another, or literary affairs, or history of philosophy, I finally became a historian because it had the fewest prerequisites.

So I got the job and came here with another young man on the faculty, Charles Alexander, who was primarily a specialist in the Ku Klux Klan in Texas. He had had no military experience. I was a shavetail lieutenant USNR [United States Navy Reserve] by that time, burr haircut. Was very much interested in going seriously into history of technology per se. There's precious little science in Mercury, Gemini, or Apollo. It's mostly technology. So that's how I got interested.

The first thing we did was to watch all the video that had been produced, and there was tons of it. So that took about three months. Then we began to organize the chronologies. James M. Grimwood, the MSC historian at the time, had done the dirty work in collecting documents and

making sure these engineers didn't throw away history. So we had a lot of collating and reordering, reorganization to do with the simple chronological growth and development of Project Mercury from 1957, really a year before NASA was established, through 1963 when it was done. I arrived in Houston the day the Houston Post carried a headline: Project Mercury Is Dead. That was a perfect time for a historian to go to work. Okay, John, stop fidgeting. Your turn. Did that answer your question?

WRIGHT: Yes, it did. Do you remember where you were working when you met Dr. Swenson?

BOYNTON: Well, he has to answer that. I don't know whether he came in to interview people while Mercury was still flying or after MA-9.

SWENSON: It was dead.

BOYNTON: Okay. But had we transferred to our new jobs? Was I already working for Johnny [John P.] Mayer?

SWENSON: Yes. I very much got to read both the transcripts that he had been editing and asked me to read. I very much appreciated that refresher of the memory cores. But it was definitely after Mercury ceased operation.

BOYNTON: So it was like '64? Okay. Then we didn't have much to do between then and when you interviewed me for Apollo? Or did we do friendship things?

SWENSON: Friendship thing. ’64, ’65. We played tennis together a little bit. But the Archimedeans was an important thing.

BOYNTON: When did that start?

SWENSON: Trying to get intellectuals from Rice and Texas Medical Center and even Saint Thomas [University] and the University of Houston together for a meeting once a month. Usually on some debatable topic that would bring people out to a dinner meeting and discussion.

BOYNTON: Always interesting though.

WRIGHT: Great exchange of information and opinions.

BOYNTON: Tonight we’d be talking about the Iranian election, say for example, solve that problem.

WRIGHT: Were you teaching at the time as well?

SWENSON: Yes. The first year I was full-time research. Second year I had one class at night. Third year I had two classes at night. Then we published the Mercury history, and I went off to Harvard [University] for a postdoc, and came back the summer of the Moon flight, ’69, to work

on the research and writing the Apollo history through the Moon landing. We thought at the time we were going to do the whole Apollo history. But it got to be too much.

BOYNTON: Has anybody done the whole Apollo history?

SWENSON: Well, put these two together, yes. *Chariots for Apollo*, our version, and David Compton's book *Where No Man Has Gone Before*. This is through the [President John F.] Kennedy mandate, and this is the follow-on missions through 17.

WRIGHT: How different was it for you to collect the history and the interviews from people for the second book compared to the Mercury program?

SWENSON: Well, it's an order of magnitude larger really. I did probably in the neighborhood of 400, 450 interviews as the primary investigator. Usually three of us would go along to the contractors all around the country and interview the chief engineers and the chief business executives and some of the primary people, like John [F.] Yardley you make a lot to do of. Extraordinarily important man at McDonnell Douglas.

BOYNTON: Brilliant guy.

SWENSON: For the Mercury spacecraft. Gemini as well, because it was a straight follow-on. Then I very much liked Max [Maxime A.] Faget and Caldwell [C.] Johnson. But from his standpoint they're just old civil service employees.

WRIGHT: It's nice to have a different perspective. John, did you offer any assistance or background information during the collection of information for the book?

BOYNTON: I don't remember anything like that. He just asked me what my experiences were, and I told him honestly.

SWENSON: Well, you had all those mission reports, John. Those mission reports were extraordinarily fine documents.

BOYNTON: Yes, they were. I certainly knew a lot about systems and performance and development. He asked me a lot of questions about that. But I also knew the people. I think I'm really a good judge of people. How long was Caldwell around?

SWENSON: I think he retired here. But you know a funny thing. Bob [Robert R.] Gilruth, the head of the Space Task Group in the first place in Virginia and then the head of the Manned Spacecraft Center here, which soon became the Johnson Space Center, was an extraordinarily taciturn smoother-out of acerbic personalities.

BOYNTON: Gilruth? Yes, yes, he was.

SWENSON: Gilruth was a brilliant but unsung hero because he was so inarticulate.

BOYNTON: But he didn't want it. Gilruth did not want the limelight. But he got people always going in the right direction.

SWENSON: I got this from other NASA directors too at the other NASA centers. We were talking—coffee beforehand—about the importance of emphasizing 14 NASA centers, all of which had some—some more, some less—input into the manned spaceflight program.

BOYNTON: Especially Goddard [Space Flight Center, Greenbelt, Maryland].

SWENSON: Bulk of the money of course was coming here and to Huntsville [Marshall Space Flight Center, Alabama] for the—remember, it was Saturn/Apollo or Apollo/Saturn, big fight, which word should go first. So Roger Bilstein's book *Stages to Saturn*, which is in here somewhere, is an extraordinary contribution too.

BOYNTON: Let me mention one thing that I think we'll get into a little bit later as far as the contributions of Mercury, Gemini, Apollo. I want to say about Bob Gilruth, we landed on the Moon in 1969 and achieved that goal of doing it by end of decade. If you had to pick one person that said who was the most responsible for us making that deadline, it was Bob Gilruth. You could look at all the project managers and program managers and Faget and all those people. They didn't have a lot to do with schedule. But Gilruth would go in a meeting and keep it going and keep it focused. They would actually walk out of the meeting with some resolution, whereas if he hadn't been there, they'd still be fighting, especially after the fire.

SWENSON: A very interesting anecdote about this. I interviewed the chief leaders of the other NASA centers who had a big input. One of them was Abe Silverstein at Lewis [Research Center, now Glenn Research Center] in Cleveland [Ohio]. Another one was Wernher von Braun at Huntsville. There was no love lost between Huntsville and Cleveland. It was Gilruth who steered the path between them and smoothed out that incredibly deep hostility. Remember, this is living memory for both those guys.

WRIGHT: Did you find those, Dr. Swenson, that you had interviewed to be open with their information for history? Especially during the time that you were collecting the information.

SWENSON: It took technique. It took listening and asking the kinds of questions that they sort of anticipated, but not quite. I say this especially with regard to the industrial leaders outside of NASA. Because the fight for contracts were endemic, and the industrial leaders were always suspicious that the NASA bureaucrats were simply timeservers. So there was that problem.

But so far as cooperation is concerned, inside NASA, especially here in Houston, people were proud as they could be of what was going on. Until the fire, of course, in ’67. So that pride translated itself directly into yes, I want to contribute. After a little talk, “I’ve got a document here. It’s in one of these drawers, let me see if I can pull it out.” So we collected a lot more documentary material. As you know, we had to rely on the printed word more than on the verbal exchanges. But the verbal exchanges were extraordinarily important in setting the tone as to which documents to pay primary attention to.

BOYNTON: Did you get many conflicts between testimony? One guy said this was an important thing, another guy said no that wasn't so important? Did you get any conflicts?

SWENSON: A little bit. When we move from Mercury, which was ancient history by the time I got to it, to Apollo, which was ongoing events, there's one perfect example. The so-called LOR decision.

BOYNTON: Lunar orbit rendezvous.

SWENSON: Lunar orbit rendezvous. The idea, without having been there yet, to go that far away to the Moon and then do this dangerous, dangerous game.

BOYNTON: Precise rendezvous.

SWENSON: Tearing your spacecraft apart in two pieces and pulling it back together again at that distance, and with the time delay—a lot of pride of course in the ongoing computerization and miniaturization and so on. But like nothing compared to today. The computers were quite primitive in all respects, on board as well as on the ground. So the LOR decision was another one of those things that Gilruth had to take a very strong position on because von Braun wanted to do Earth orbit rendezvous, send up a bunch of big rockets in Earth orbit and put them together there. Then go to the Moon and land the whole caboodle.

BOYNTON: The whole stack.

SWENSON: On the Moon. Then leave half that on the Moon and come back. So that seemed to be simpler. That seemed to be less dangerous. So the fight between Huntsville and Houston was strong and lasted probably more like nine months than six months. But it was finally decided in terms of technical simplicity. Especially redundancy.

BOYNTON: I want to make a comment because I won't remember it later. It's something that's very important. I was involved in a study out at General Dynamics in 1960. They gave a contract to GE and Martin Marietta. Each of these companies said, "This is how we would design a spacecraft if we did it the way von Braun said we're going to do it," which was a direct landing on the Moon. So we designed this spacecraft. We had this huge landing stage. The whole command module. The interesting thing about the three studies was NASA didn't use any of them. When they came out with the request for proposal on designing the spacecraft, it was almost totally different from what we came up with in the study, because they shifted to lunar orbit rendezvous. So it's interesting that they spent all that money for these three studies and all that work that was done. Hardly used any of it. Any of it.

SWENSON: The other factor about that is the size. Have you ever seen a Saturn V launch?

WRIGHT: No.

BOYNTON: Very few people have.

SWENSON: It rattles the bones, it really does.

BOYNTON: Yes, it's unbelievable.

SWENSON: Three miles away.

SWENSON: The Saturn V would have been half the size of what was conceptually called the Nova rocket at that time. The Nova would have been twice the size of the Saturn V. Had we gone with von Braun's dream.

BOYNTON: It was impractical. The noise from a [Space] Shuttle launch is very similar to what a Saturn V, because the rockets make a lot of noise. But I was there for the first Saturn V launch. It really was deafening. You thought the world was coming to an end. If you go watch a Shuttle launch it's almost the same thing. Very noisy.

WRIGHT: What mission were you there for for the Saturn launch?

SWENSON: Apollo 11.

BOYNTON: I was too.

SWENSON: Whole family came along.

BOYNTON: We were there.

SWENSON: I got the ticket to go to the seats right next to [President] Lyndon Baines Johnson. My kids were seven miles away.

BOYNTON: I was within a few feet of Loyd because I was down there on the radio. I was actually talking on the radio and talking about the launch.

SWENSON: Relevant to this thing, speaking of Lyndon Baines Johnson, President of the United States, have you ever held a letter written by a president of the United States?

WRIGHT: I do not believe so.

SWENSON: This is my prized possession. When I first got the job—actually six months later—I wrote to Dwight David Eisenhower asking him for his personal opinion on how Mercury got authorized and got going. He sent back this four-page dictated letter. Maybe that's done by a machine, I'm not sure. But here, I hold a letter by a president of the United States to your friend now.

WRIGHT: How exciting. From 1965. Isn't that wonderful? I notice, though, he's got at the top it's personal and not for quotation. He sent this directly to you. But it's nice that he responded.

BOYNTON: Speaking of letters, Loyd, I came across a letter just the other day. I was going through all my memorabilia.

SWENSON: Yes, he writes to presidents and chief administrators all the time, but I never do, and that one I lucked out on.

BOYNTON: Yes, I write to people. Anyway, I have a letter from George H. W. Bush, Sr. before he was president. I forget what I wrote him for, but it had something to do with government—oh, he was a congressman, that's right. I wrote him as a congressman. I have a signed letter by him, George H. W. Bush. Well, let's get into our heavy stuff on the three programs.

WRIGHT: Yes, let's talk about it. You wanted to share some information and some thoughts about the value of how the Mercury, Gemini, and Apollo program were for each other.

SWENSON: Gemini never would have existed had not Apollo been authorized first. It was an attempt to capitalize on Mercury. So Mercury was the pioneering Kitty Hawk, North Carolina, first powered flight if you will.

BOYNTON: Purpose of Mercury was simple, to see if a human could work and live in space in a weightless environment and do things. Actually do things. They were so afraid of so many things. So Mercury was just saying, "Let's put a guy up and see whether he'll survive." As you know, the Russians did it first. We had no idea what they were doing. But Mercury proved that a guy

can go into space and flip buttons and get back and keep his wits and not get sick. So that was a great accomplishment.

Gemini was not a follow-on to Mercury. It was to develop the rendezvous concept. Maybe we could have redesigned Mercury to do a rendezvous. But Gemini wanted to have a two-man crew and find out whether two guys could actually bring two spacecraft together. As you know, we had rendezvoused with the Agena stage at one point. Gemini was an incredibly successful program.

In fact, I wanted to say one comment about why all three programs were successful. I think this is just a generalization. Mercury was successful because it had people working on it that wouldn't quit. The smartest guy in Mercury was not me, it was a guy named Bill [William M.] Bland. Kenny [Kenneth S.] Kleinknecht was a great manager. But the people who worked for Kenny would never quit. Joe [W.] Dodson. You look at all those guys. Lew [Lewis R.] Fisher. They would not quit. They were the chewing gum and baling wire kind of people.

Gemini was successful because it was incredibly well managed. Jim [James A.] Chamberlin was the guy who did most of the good work in Gemini. Gemini was very successful because by God, the managers knew what they were doing.

Apollo was successful not because they had great managers—and they did periodically have great managers. George [M.] Low was one of them. But they were successful because they were lucky. I hate to say that, but Apollo was incredibly lucky to have six flights and nobody lost their life. Actually seven flights. So they were not because of technical expertise, not because of great management, in my opinion. Now Loyd may have a different opinion. But they were lucky. Apollo was lucky, really really lucky. When you go 220,000 miles out into space and land on this hard rock and actually make it back, it's amazing.

SWENSON: One of your favorite quotes is from Christopher Columbus Kraft, Jr., who said, "I'd rather be lucky than smart."

BOYNTON: He used to say that at every other meeting. It's true. We were lucky.

SWENSON: Isn't that amazing? Christopher Columbus Kraft, Jr. fell into this job from being a country boy in Virginia. Makes you wonder about grandparents' and parents' discussions about me.

BOYNTON: In my interview with you before, I mentioned that he went to United Technologies up in Connecticut to work for them. He didn't have a birth certificate. So he waited and waited and waited in the motel room. He said, "To hell with it." He got on the train and went back. So that's how he got to be at Space Task Group, because he was waiting for a birth certificate that never came. It's amazing how your life takes a direction. Chris was a perfect guy. The absolute perfect guy to do the operations management. Like he said, he told all his guys, "I'm not so smart, but by God, I'm damn lucky, and you guys can work it so you can create your own luck." He said that in every other meeting.

SWENSON: He too had to work with these prima donnas, these right stuff guys, these astronauts, test pilots. Cream of the pilot team.

BOYNTON: One of the most brilliant things that Chris did, by the way, was they had a position on the consoles called CapCom [capsule communicator], and CapCom was by edict an astronaut. He didn't want anybody talking to a guy up in space that was an engineer or a management type. He wanted everything to go through another astronaut. So CapCom, capsule communicator, was a guy on the ground that talked to the crew.

SWENSON: Generally an experienced astronaut who'd been there and done that and knew the jargon and knew the tone of voice and the countless little things that go into crew communications.

BOYNTON: Chris had authorization that he could talk to the crew if he wanted to. The flight director could talk to the crew. Like Gene [Eugene F.] Kranz. But generally that was a no-no. They would only give a clarification if the CapCom didn't quite get it, that kind of thing.

WRIGHT: Well, before we get off of Apollo, and since we're talking about astronauts, I believe I've asked you before about where you were with Apollo 11. Since the 40th anniversary is coming up, Dr. Swenson, and we know you were at the launch, can you tell us just a few minutes about that experience? Then also watching the men walk on the Moon? Especially since you'd collected so much information? Your thoughts about that?

SWENSON: It truly was a peak experience in my life. I think in anybody who was actually there and most people around the world who watched it on television, fuzzy though it may have been. That night when a small step for man, a giant leap for mankind, was taken. Cape Canaveral [Florida], I had visited twice before for interviews during Mercury, and just before Gemini got

started. So I knew the people down there who were in the history office. Understand, every one of the Manned Spacecraft Center groups had at least three, sometimes five, people. Civil servants who were doing history of that center, or parts of the program. But the program historians like us here were different from the civil servants. Hot and humid. Banana River. People camped out in all directions.

BOYNTON: Titusville.

SWENSON: That night before the launch, on the horizon, you could see that steeple floodlit from all directions with the beams going off into the sky.

BOYNTON: It was surrealistic.

SWENSON: Really amazing. I wrote a poem that night. A prose poem, but nonetheless one that has never been published either, but primarily for the kids.

BOYNTON: About your feelings?

SWENSON: Yes. It was very much a long range, this is the birth.

BOYNTON: As I look back over my life, I think about the women that I've cared about. The love of my life was a lady named Jan Gunnarson (phonetic), and she and I dated for two and a half years. She flew down to Florida with me for Apollo 11. But we went down to drop a guy off who

had to work there during the flight. So we dropped him off at an airport in Melbourne. Then we went down to Fort Lauderdale, dropped my daughter off. She was going to visit a friend. Then she and I went over to Freeport. It was the first time I'd ever flown over the water. We spent two or three days on the Bahamas. We flew back and stayed at a little motel on the east Florida coast. Santa Clara, I think.

Then the morning of the launch we got in my airplane, my Bonanza, and flew up to Titusville. There's an airport right beside the highway. So we landed at Titusville. We walked to the gate. She stood there at the gate and watched the launch. She couldn't go any further. And I had a ride in because I had a pass. As I told you, I was talking on the radio.

Funny anecdote about that is I had a camera with a long lens. I said, "Jeannette, I'm not going to be able to be able to take this camera in because it's confidential and all that. But I want you to take a picture of the launch. Make sure you don't shake it, because if you shake it it's going to be blurry and it'll be wasted." She said, "You didn't think I could take that picture, did you?" She took a picture and it was perfect. So I have a picture of the launch that she took herself.

But after they got into orbit, we got back in the airplane. We flew back to Houston, and of course I was here for the landing. The thing that Loyd almost mentioned is it meant a lot to the people who had started at time zero. I was one of the few people. Maybe a couple hundred people worked on Apollo in 1960. So it was the culmination of ten years of work. So it meant a lot to me. I sat in the auditorium at Building 1, which is that short building where they used to have the LM [lunar module], and watched the screen when Neil [A. Armstrong] got down off the ladder. It seemed like it was out of a science fiction movie. It was just amazing that they did that.

SWENSON: Me and my family after the launch, four days later, went to Juniper Springs in the middle of Florida. Beautiful little state park I think it is. At a motel there with four screaming kids on a fuzzy motel television watched the landing.

BOYNTON: Not the landing, but the surface operations. You couldn't see the landing.

SWENSON: Well, yes, of course not. But the famous quote.

BOYNTON: "One [small] step for man."

SWENSON: "A man" or "man."

BOYNTON: Yes, but that's no big deal.

SWENSON: Oh hell it isn't. I made a real hit with Wernher von Braun when he and his Frederick Ordway came out with the immediate six weeks later history of flight, history of rocketry, everything, and ended with this quote. Which was the PR [public relations] quote. That's what the PR people wanted him to say. That's not what he said. You can listen to the tape over and over again, you can analyze.

BOYNTON: Doesn't make any difference.

SWENSON: The "a" is left out.

BOYNTON: They don't need to spend time arguing about something like that.

SWENSON: Well, not from your standpoint, but from the standpoint of literature and history it's important.

WRIGHT: Yes, one word can make a difference, can't it?

SWENSON: Every punctuation mark can make a difference.

WRIGHT: Well, I wanted to ask you too. You were talking about being there the night before and then for the launch. Then being in close proximity with former President Johnson. The activity in the stands must have been—

SWENSON: Grandstands, yes. We were not enclosed. It later on became an enclosed area, in part. But this was completely just a sun cover for the super VIPs. But those of us not quite so super, see, I was Eugene [M.] Emme—the NASA historian's—emissary. I got to go, and he didn't. So I had to report back to him personally on that score. There was one other thing too. International conferences on history of science and history of technology. In 1973, I got to go to Moscow and read two papers by Eugene Emme for him and two papers of my own, one in history of science and one in history of technology. One on Einstein and one on spaceflight.

But the interesting thing was that it was easier for us contractors to move around the world than it was for NASA bureaucrats. Budget constraints and boondoggles and worries about things

like that. But we had a very generous—not unlimited, but we had a very generous space travel interviewing budget with per diem.

WRIGHT: When you came back from those trips did you have to make reports? Or was it mostly for fact-finding for you as well?

SWENSON: Well, this was all recorded, and our secretary at the time, Sally [D.] Gates, who had once upon a time, early in Mercury, been a secretary to the astronauts, Sally Gates was our transcriber, and she was superb, because she knew us and knew our nuances and could translate the words that we used.

BOYNTON: Was she a secretary after Nancy Lowe? Because Nancy Lowe was the original secretary to the original seven.

SWENSON: Yes, I think so. Quite a bit later. To the second or third class of astronauts probably. But that's somebody else you ought to interview if you can. Sally Gates.

BOYNTON: She alive?

SWENSON: I don't know. I've lost nearly all contact with you people. I therefore am extremely interested in finding out what the situation is in Washington, over at the center, and at Clear Lake. Have you interviewed Roger [E.] Bilstein at Clear Lake?

WRIGHT: No. Roger has moved to Dripping Springs [Texas]. So he's there. I know him. In fact, he was probably my most favorite instructor I ever had. I was privileged to take a class from him. But that's where he is now. He has retired there.

SWENSON: Prince of a guy.

WRIGHT: You lived the program from the inside, John. But you collected information as the program was going. Plus your experience with that. Dr. Swenson, did you have opinions when you walked into your Apollo project that might have changed as you learned more information? Or did you go in with an open mind about what type of information you'd be collecting and what type of book you'd be putting out?

SWENSON: I certainly tried to be as professional as possible about it and keep a balanced.

WRIGHT: Well, I just knew from the Mercury you had learned so much. Where Mercury, of course, everything was new, the space program was new. You were new to that space program. But now you had experience.

BOYNTON: The people were new too, yes.

WRIGHT: Yes, the people, and then I'm sure you talked to some people from Mercury and then again in Apollo. So I just was curious about what changes you encountered, or some of the challenges or the experiences that were unique to working on the second book, because usually

the first book is always unique. But how was the second book and gathering that information? Then of course your thoughts on Apollo?

SWENSON: Well, the difference was an order of magnitude difference. Mercury was essentially done by four people, five people. The Mercury history.

WRIGHT: I understand.

SWENSON: Well, Grimwood did the chronology and he had a master's degree in history, and he'd been a military historian at various places before coming to NASA. As I said, Charles Alexander had no experience at all, was just young and eager enough to give it a try. [History of] Ku Klux Klan background. So social history was his forte. Here I was, a Q clearance secret, US naval officer, gunnery officer, but intelligence officer too of sorts. In the Pacific trying to find ways—we were trying to find ways in my destroyer squadron—that means eight destroyers Sumner class—to deliver an atomic weapon without killing everybody making the delivery. So we'd get out in the middle of the Pacific Ocean and triangulate and have these super jets come in. Skimming over the water, then go straight up, and release the bomb at the top, and then dive almost down and back to the surface and skedaddle.

BOYNTON: Called an over-the-shoulder maneuver.

SWENSON: So those kinds of experiences could not be communicated very well to Charles Alexander or even to Jim Grimwood. But the secretarial help was all supplied by civil servants,

by employees of MSC. Whereas when we got the Apollo contract, there was as many as ten of us working around. Most of them were civil servants still, but there would be four to five bona fide historians lasting six months or a year or this, that, and the other. It waxed and waned. Courtney [G.] Brooks was fresh with a PhD from Tulane [University, New Orleans, Louisiana] where he had written a doctoral thesis on sports aviation. So he was not really into missilery or rocketry or high tech stuff, except insofar as sports medicine is an important part of the culture. The Experimental Aircraft Association of which John is a member meets in Oshkosh, Wisconsin, and they exchange all kinds of interesting ideas every year.

BOYNTON: It's an amazing operation.

SWENSON: But the Apollo budget and interest. See, I told you that I went to work on research and writing the history of Mercury the day the Houston Post carried the headline "Project Mercury Is Dead." Well, almost the same thing happened. The first thing I did working on the Apollo history was to go to a launch. So that was the achievement of Kennedy's and NASA's mandate to begin with. Then Apollo 12, of course, was pretty much a carbon copy of Apollo 11. Then 13, something else again. On we go. But it gets interesting, and therefore it's a separate topic, a separate book.

BOYNTON: [Apollo] 13 is such a great story, and it's going to be a story forever. It's amazing that they got back alive. I was on the radio for 11, 12, and then 13. By the way, the reason I was on the radio—someone may read the transcript later on. What's a NASA guy doing on the radio? My job was always before the flight and after the flight. Before the flight, I had to see what the

objectives were and what we were going to accomplish and what we were looking for to work right. Then after the flight, of course, I had to write up the results.

SWENSON: That was the official radio station for [MSC].

BOYNTON: KMSC.

SWENSON: KMSC, MSC meaning Manned Spacecraft Center.

BOYNTON: They came into existence just to support the Apollo program. I asked them if they could use me on Apollo 11, and they said yes, and they said, "We can't pay you much." So they actually gave me money for Apollo 11. Then when I came to work for them for Apollo 12, they said, "We don't have any money. Our budget is down to zero. But we'll give you some free tickets to splashdown party." So I took it, and I worked on 12.

Then when I came to ask them if they wanted me to help with 13, because we didn't know that was going to happen, they said, "We don't have any money, we don't have any tickets." I said, "Well, sorry, sayonara." Then I was driving back from U of H [University of Houston]. I was taking a night class at U of H. I'm driving back in my Jaguar down the Gulf Freeway. I turn on KMSC. "We've got this horrible problem on 13. We don't know what's happening." Gordon Bassham was the guy that was on the radio. Friend of mine. "NASA is just going crazy trying to figure out what's going on." I called him up as soon as I got home. I said, "Gordon, do you need some help?" He said yes.

I went down, and we talked about the fuel cells and what had exploded. Anyway, I didn't finish my sentence. Basically my bosses told me to get the hell out of the way during the flight. "Don't ask me any questions. Leave me alone." So I had free time. So why not use it? So that's why I worked.

WRIGHT: Tell me a little bit more about the station. Was it associated at all with public affairs, or this was independent?

BOYNTON: It was someone deciding to make money by selling ads. They knew that there would be a bunch of people interested in the hardcore NASA coverage. By the way, they ran the air-to-ground voice continuously when they weren't doing any programming. So you could turn on the radio and hear the astronauts talking to CapCom.

SWENSON: Like the Weather Channel for space enthusiasts around here.

BOYNTON: It was space all the time, 24 hours a day. When they weren't giving programming, like we were coming up to a burn, they're going to do this and that, you could turn it on, and there would be blank air for like two minutes. Then "What are we going to do, Floyd?" You'd hear someone talk to the ground. You'd hear the typical. But it was a great contribution. Of course, it folded up right after Apollo 12 or 13 because nobody listened to it.

WRIGHT: Where was it broadcast from?

BOYNTON: There was a station down here. They had put up an antenna. It wouldn't go very far.

SWENSON: Was it in that same building outside the compound?

BOYNTON: It was in Nassau Bay, I know that.

SWENSON: Was it in that same building that overlooked the main drive into Building 2?

BOYNTON: Yes.

WRIGHT: Was it off site?

BOYNTON: It was right across the street in Nassau Bay. They had an office over there, and they had a tower. I don't think you could pick it up on the other side of Houston. If you were down around Houston, you were lucky to get it on your radio. But everyone down here, all the NASA people, listened to it.

SWENSON: I lived in Bellaire at the time and I could pick it up.

WRIGHT: It's pretty interesting, because that's pretty good mileage. Of course we didn't have as many buildings in the way that we have now. But that's pretty neat.

SWENSON: But CBS and Walter Cronkite and so on were in a penthouse building triangle that looked straight down to Building 2. Ever notice that? What's Building 1 on the campus? Public affairs building. Building 2 is the administration building. Public affairs is one floor.

WRIGHT: Actually, they've switched now.

BOYNTON: Historically—you have to be accurate now. At one time Building 1 was a tall executive building with all the big cheese, and Building 2 was public affairs. Then they got into so much confusion about people coming in and wanting to go to the public affairs demonstrations, the LM and that stuff, they said, "Go to Building 1, go to Building 1." So they changed it. So when I worked, I actually worked in Building 1 when I worked for Chris Kraft. I was on the eighth floor. It was Building 1. But then they changed it.

SWENSON: There's also the military and engineering mentality where all these things are known by their numbers. The 204 fire, for instance, gets named two or three years later as Apollo 1. So 204 stuck.

BOYNTON: AS-204, yes.

WRIGHT: I have a curious question for both of you, since you both spent time writing during the Apollo time. Were you ever asked not to include information in your reports for security reasons or for other reasons? Especially as a history? Were you allowed to pretty much utilize your judgment?

SWENSON: I told you I had a clearance, and that probably helped me get the job in the first place. Fresh out of the Navy and fresh out of graduate school. But refresh my memory.

WRIGHT: Having to withhold any information that you might have collected.

SWENSON: Yes, to get this published, *This New Ocean*, based on Kennedy's speech in Rice Stadium where he used that phrase, we had a hellacious fight with the Air Force. The Air Force wanted to write their own history of manned spaceflight. I think you can see why at that stage of the game. So it was only through the good auspices of the associate administrator in Washington, DC, Hugh [L.] Dryden, that the Air Force was put in its place and NASA was given full faith and credit to write its own history. See, had it been done by the Air Force there would have been a hell of a lot more on the X-15. There would have been a hell of a lot more on missilery.

BOYNTON: But you didn't answer her question. Did you have to suppress any information?

SWENSON: No, but we almost did. The whole book almost got suppressed by the Air Force fight. That went on for six months. Finally was published in '69. One of my proudest moments in later years was right after the 204 fire, where Wernher von Braun again goes before Congress and he explains to Congress committee how the pure oxygen atmosphere was chosen in the first place, by reading two paragraphs out of this book. Those paragraphs I had written, thanks to people like John and others.

WRIGHT: Quite a compliment.

BOYNTON: There was no need for us to have pure oxygen on the pad when the guys died in the fire. We didn't really need to have pure oxygen. They did it for completeness. They wanted to make sure it was as close to the space real flight as possible.

SWENSON: Especially when they found out the Russians had gone in a shirtsleeve atmosphere. As ambient as possible. If the Russians did it that way, why didn't we do it that way? Well, one of the answers was partial pressure sensors. They were not very reliable yet. Parts per million. That's not an easy thing to measure.

BOYNTON: On Mercury we were paranoid about anything we put into the report that would cause public dissatisfaction because they were afraid that the whole program would get canceled if we admitted even simple things. For example, the fact that Scott Carpenter had elevated pulse and blood pressure. If we'd put that in, they would have said, "What did we do? Why did he lie? What was going on?" So we put in there that the equipment failed. It was a direct lie. I hate to say it. But they were paranoid about anything getting out that looked like we didn't know what the hell we were doing. So it was suppressed, especially in Mercury. I can't speak for Gemini, but I can tell you this. They were lucky because they had very few problems on Gemini. The only one I really remember was they had an adapter that hung open on the Agena, and they had the spin-up of Dave [David R.] Scott and Neil Armstrong, and those guys almost didn't get back. But that was reported in the public news media pretty accurately. They just told what happened, and that they were lucky to get them back.

In Apollo, we almost got the program canceled because of the fire. That was a terrible tragedy. I would not have blamed Congress if they'd said, "Look, if you guys are going to start killing people, just forget it, we're going to stop this." I think we really came close. It was only because some really smart people sat down with the President and the congressional leaders and said, "We can solve this, we can make sure this doesn't happen again. We still want to go to the Moon. We still want to land." They finally said, "Yes, go ahead." For a year and a half we didn't fly anything. The public wasn't involved in what we did for a year and a half while we went back and completely redesigned the command module.

It's been said, I want to add that it's been said many times, Gene [Eugene A.] Cernan said it, I've said it, probably Loyd said it. We would not have landed on the Moon by 1970 had we not had the Apollo fire, which is a shame to say that they gave their life for that. But the redesign made it possible to make it.

SWENSON: That was proved by Apollo 7. Then glory of glories, that crazy decision to circumnavigate at Christmastime for Apollo 8, which was a gutsy thing to do too.

BOYNTON: They went into orbit, by the way. They went into orbit. They didn't just circumnavigate. But it was an extremely gutsy flight. The interesting thing is I worked on 7 all the way through 13. It was one of the cleanest flights we had. We used to come up with what's called an anomaly list. If a screw didn't work right, it went on the anomaly. If a guy's earplug. We only had like 25 or 30 anomalies, and they were all minor. We really had no serious problems on 8. It was like hey, how did we do that. Because we had problems on 9. We had problems on 10. 10 had some real problems. We wondered whether we should launch 11 or not. Fortunately,

we chased those things down, and we launched 11. But 10 was at the Moon, and those guys didn't do so well on their little mock rendezvous. But anyway, 8 was extremely clean. It was so moving. I'm now spiritual at age 72; I wasn't then. When they read from Genesis coming around the Moon and you saw Earthrise, you don't get any more romantic than that.

WRIGHT: Not for the space program. Your thoughts on Apollo 8, Dr. Swenson?

SWENSON: Yes, yes.

BOYNTON: Well, it was Christmastime. What a wonderful Christmas present for mankind.

SWENSON: Yes, but it was the Space Race. This is the point at which it came to a head, because it was pretty obvious that the Soviets were close to circumnavigating, if not orbiting, the Moon. So Frank Borman, who you said many times one of the guys you respect most as an astronaut, I didn't know him personally.

BOYNTON: Very smart guy. Smartest astronaut, I think. Smartest astronaut that ever came out of the program. Go ahead.

SWENSON: But Frank Borman had a great role in convincing the administrators and the directors and the engineers that we could do it. We can do it. We can do it now. We ought to do it now. We can't afford to be second best. Throughout a whole decade.

BOYNTON: They knew they were risking their lives, because it was not a man-rated Saturn. See, we had not gotten to where all the nines fell into place, which we call man rating. So the Saturn could have blown up and killed every one of those guys. But they got on, and they went, and they said, "We'll do it."

By the way, I want to mention something that's interesting. I was plugged into a lot of different places when I worked at NASA. I heard a lot of things on the grapevine. But I never knew that we suddenly moved 8 up. Or actually, 8 was manufactured. It was conceived. I didn't know that we did it because of the possibility that the Russians were going to do something imminent. Because that was intelligence that I had no access to. I thought they just decided to do something nice early.

SWENSON: Let me say something else for the record, Space Race-related, that came out of documentary research, futzing around in astronaut papers and reports and stuff in 1969. I ran across a document in very poor broken English which had been a telegram that was translated into English from a Russian engineer, congratulating Alan Shepard for being the first American astronaut. Even though just up and down, not around like Yuri Gagarin.

BOYNTON: Who wrote it?

SWENSON: Yes, he's dead now, but he is the great director. I lost it. I don't know what happened. But that document is priceless, I think, to indicate something of the camaraderie of the chief leaders of rocketry and spaceflight despite political differences. For that missive somehow or other to get sent back to Alan Shepard because of the publicity.

BOYNTON: That's a good segue into something I wanted us to do today. We're running short on time. I would like to have both Loyd and I comment on the programs after Apollo. Because neither he nor I were intimately involved in them. We read them in the paper like you did. But obviously with a different interest. I wanted to say a word about Apollo-Soyuz. It was strictly a stunt. There were no scientific objectives. There were no operation objectives. We weren't proving any system worked or didn't work. We proved that the Russians and the Americans could do something together. They had to redesign the interface so that they would dock. The Soyuz and the Apollo actually came together, and was it [Thomas P.] Stafford? I think it was Stafford and [Donald K. "Deke"] Slayton.

SWENSON: Slayton. Deke. Deke finally got to fly.

BOYNTON: He finally got to fly. It was just a stunt. Of course, the Russians thought that was great. So it was either the beginning or part of perestroika and detente. What's amazing today is that the Russians have worked with us so closely on the International Space Station [ISS]. They've done 80 percent of the foreign work. The Japanese obviously involved, and the European, and the Canadian. But the Russians have done beaucoup yeoman's service. But anyway you got a comment on Apollo-Soyuz? It was in '75. I do remember that.

SWENSON: I think handshakes are quite important, especially when we had been flipping the birdies at each other for ten years.

BOYNTON: Things burn in your mind. I remember Neil coming down the ladder. It was black and white. I remember it seemed like it took an hour and a half to open that goddamn hatch between the two. When they opened it, you saw Stafford. Hand reach through. Then so they had the television camera set up. I remember that and what a great day that was. But that was it. It was just a stunt. An international stunt.

SWENSON: After this is over, maybe you could tell us a little bit about what you found lacking in what we produced here. But you'll notice there's precious little social history. Since these were written, social history has begun to dominate the history profession. What I call squeaky wheel history. Women's history, black history, brown history, Jewish history, etc., etc. But the lack of attention to the wives of the astronauts, the human interest story, the Life contract, that sort of thing we alluded to but didn't dwell on, because there's popular literature overkill on that. We thought, and I think rightly so, that the engineering and middle management, not Washington intrigue, not the contest between Navy, Air Force, and Marines, and NASA so much as what—like the LOR decision. Good case in point. That's a technical decision. It takes some investment to understand what's going on there and looking at the profile of how you're going to get to the Moon and get back safely within a decade. So the other kinds of things like all these systems. Every one of those systems was a work of art. Engineering work of art.

To work out the details for Mercury, Gemini, and Apollo, one, two, three, metabolism of human beings in there, and lives at stake, all that talk about robotics versus human aspects, manned spaceflight versus robotic spaceflight, is to me completely overshadowed by the medical advances. It's just incredible what we learned. Much of this is still relatively unappreciated. John thinks the most important part of this is digitalization.

BOYNTON: From up through Apollo.

SWENSON: We wouldn't have the computers we have now were it not for the Moon program. But it's all these little things. Not just weightlessness either, although that's interesting. Vestibular, and whole body response to free fall forever, or at least for a day or two days or five days or ten days or whatever.

BOYNTON: Remote bioinstrumentation.

SWENSON: Just wonderful. What we learned about man in manned spaceflight.

BOYNTON: Let me make a comment, Rebecca, that I think is important. I hope someone does this before it's too late. I don't know whether I could do it.

SWENSON: Correct that. What we learned about humans in manned spaceflight.

BOYNTON: Yes, I want to add on to what he said. In everything that I've seen that documents the dramatics of the manned space program, I think of *Apollo 13* and I think of *From Here to the Moon*, which is the HBO series. There was another series which was more technically oriented. I think *From Here to the Moon,* they dramatized it. But there was also a technical series about what we learned. But in all of those, there was never anything very accurate as to how the astronaut families interwove into the story, with the exception of the later flights of Apollo. *From Here to*

the Moon you saw how the families were interacting there. But the portrayal of the astronaut wife is so funky. That's the thing I hated about *The Right Stuff*. It was just really bad. They didn't go around crying. "My husband is not going to get back." They were dead accepting that their husband may not make it back, and "Hey, we're going to survive, we're going to get the kids to school, we're going to get some money." Most of them were very brave. But most of them had no idea what their husbands were doing. But someone should get in and document that.

SWENSON: These were military wives before women were really accepted in the military. But as military wives, they had a culture to themselves, and they knew how to absolve grief sort of in their own way. Remember, we were on the cusp of the sexual revolution, too, in the '70s. The pill is in the background. That makes a tremendous cultural difference in the kids' behavior.

BOYNTON: By the way, a lot of the astronauts were unfaithful to their wives. Most of the time the wives didn't know it because they traveled so much. But that stuff was going on because it was the '70s. A lot of astronaut wives said, "Just don't tell me, I don't care what they do, just don't tell me." But there's something else I was going to say. In *Apollo 13*, the technical aspects of it were extremely accurate. They really did report it accurately.

SWENSON: You're talking about the movie now.

BOYNTON: The movie, yes, *Apollo 13* the movie. But the wives, they didn't act like that. They didn't sit around and hold each other's hands, "Are they going to make it back?" They knew there was a chance they weren't going to make it back, and they were already prepared for that.

WRIGHT: While we're talking about the end of the '70s, or actually I should say the mid '70s, with Skylab, being history of science, how did you feel about Skylab? Did it take the space program into a new era?

BOYNTON: Was it a contribution in your mind?

WRIGHT: Was there more of a science aspect that set a precedent?

SWENSON: I didn't write the history of Skylab, so I don't know near—

BOYNTON: Did anybody write the history of Skylab?

SWENSON: Yes. Matter of fact, right over your shoulder there. But anyway.

WRIGHT: More I guess of a thought, since you had been so much involved with the two earlier programs.

SWENSON: Well, you see, unlike John here I really believe this glass is half full, not half empty. I think like William Faulkner that mankind will prevail. All kinds of things have happened and can happen. We could certainly make ourselves extinct if we don't pay attention to global warming and water supply.

BOYNTON: We're going to wrap up with that, by the way. What we think the whole future of spaceflight is. But what did you think about Skylab? Was that worth anything? Was it worth the money and time?

SWENSON: Yes, just as International Space Station is worth it. Richest nation on Earth, inspiration to the next generation, incremental knowledge, germination of seeds to strength of materials in the way nuts and bolts are constructed and everything in between. So my answer in short is that Skylab is the first step toward multicellular organisms in space. Got me? Single-cell organisms to multicellular organisms like jellyfish is quite a leap.

BOYNTON: My turn, Loyd. Skylab proved that we could put people in space and they could actually do scientific study. They didn't get any great Earth-shattering data or conclusions from space. We didn't do a lot of space science. The thing about Skylab I want to mention is it was a brilliant idea to take the Saturn IV stage.

SWENSON: Make a habitat out of it.

BOYNTON: Yes, make a habitat out of it. Because obviously it was emptied out of the fuel tanks and all that. They just put instrumentation. But it was a huge 18-foot diameter, I think. So they had a lot of room. They didn't have a lot of scientific equipment. But at least they had a place that they could take off their suits and hang around in their flight suits.

SWENSON: Do somersaults and figure out how to drink water.

BOYNTON: So scientifically it wasn't any kind of a milestone. But it was certainly a milestone operationally because Apollo didn't really have science. They had scientific objectives, and they did a lot on the Moon. But in the spacecraft almost none. So yes, it was important from that standpoint.

WRIGHT: Well, now tell us how you feel these programs have set the stage for the short term and the long term.

BOYNTON: Well, we should talk about Shuttle and ISS, and then go on to what we're going to do in the near term. But Shuttle is an amazing vehicle. I've written Mike Griffin, when he was in office, and several other people that we should not cancel Shuttle. We should make it more efficient. We should somehow make the turnaround cheaper. It costs $2 million to fly it to the Cape. Why does it cost $2 million? Why do they take so long to make a Shuttle flyable again?

SWENSON: You know the chief design flaw of Shuttle?

BOYNTON: In my mind it's the tiles, but go ahead.

SWENSON: It's a pickup truck instead of a bobtail truck. It ought to have been designed in the first place to go to geosynchronous orbit where all the stationary satellites are located. That was a perfect goal for it. But money. Cost. Downsize, downsize, downsize. So that, too, is like this

Nova versus Saturn V decision. It's just too big a chunk to bite off at that particular time. So we had to settle for Shuttle, which essentially is a pickup truck in comparison with a bobtail.

BOYNTON: I thought they would never get it funded. When I worked at NASA, they were talking about getting Shuttle. I thought they'd never get it funded because there wasn't anything for it to do. We didn't have Space Station. How are they going to convince Congress that we're going to have a little pickup truck that goes to orbit but doesn't have anything to do? But it is a very efficient pickup truck. It'll hold 35,000 approximately pounds of payload in the bay.

SWENSON: A Hubble Telescope if you want.

BOYNTON: A whole Hubble Telescope. I think they should continue for at least another five years so they don't have to pay the Russians to service ISS. But because it's a good vehicle. I think we could go to Mars. I've written a paper on that. That we ought to go to Mars and just go into orbit. But we could actually build a spacecraft in Earth orbit, like von Braun wanted to do, to send a spacecraft to Mars if it was only going into orbit. We could use the Shuttle. So that's why we could afford to do that, to go to Mars. I've been pushing that for a long time. Anyway, my concept with Shuttle is they finally got most of the bugs out of it. The thing that's really bad is the tiles are so hard to replace and refurbish. They could come up with a better way to do that, I swear.

The other thing is ISS is an amazing accomplishment from the standpoint of international cooperation that we've got. Canada is very proud of their robotic arm. That thing is amazing. They do great work with that. The Europeans of course have supplied their science module and a lot of astronauts. Then the Japanese. The Asians. So we need to get something going with the

Chinese before they go off and do their own thing. Then we're going to get in another Space Race. ISS is a very, very good project. By the way, there was an IMAX movie. I don't know whether you went to see it. Did you see that? That was an amazing film. They should show that to everybody in Congress.

SWENSON: What's the name of it?

BOYNTON: I can't remember. Probably *Space Station*. I know Tom Cruise is the narrator, which is a sexy voice. But that was in the early days of ISS. So they didn't have a lot of equipment up there, and it still was amazing what they did, and they moved those huge, big banks of instrumentation through the thing.

[pause]

WRIGHT: We've spent a little while talking about the past. I know that you wanted to offer some thoughts about future of spaceflight. So what are your thoughts on that? John, you want to start?

BOYNTON: I'll let Loyd do some talking, but I want to just go in here. Based on our experience, both having worked in the program and reading it in the paper—we read everything in the paper, and books. We can be just as accurate as any visionary. I think of Fred Ordway. He's a guy that I've met, and I have total respect for him. Loyd mentioned him at the von Braun. James Oberg, I think. Isn't that the guy that lives locally? All these people get out and spout off about what they think is going to happen. Loyd and I are just as good as any of those guys.

SWENSON: Did you take any of the future program at Clear Lake campus of the University of Houston?

WRIGHT: I have not.

BOYNTON: I did. I took one class. So you want to say something about where we're going in the near term? This new initiative?

SWENSON: Sure. There's an old proverb to the effect where there is no vision, the people perish. Where there is no vision, the people perish. Well, there are big visions and little visions. One of the biggest visions of all has been looking into ourselves and into our surroundings. I think they go in parallel. We found out more about man than we found out about space. But we had to find out about space before we could find out about man. Or humans. Sorry about that.

BOYNTON: But Loyd, get back on near term programs. I know you're being philosophical but go ahead. What should we do in the next five to ten years?

SWENSON: We should go to Mars. Quite obviously to me.

BOYNTON: I'm glad we agree on that.

SWENSON: Robotically over and over and over again. But always with the goal in mind that the questions asked on Earth are not the same kinds of questions that can be asked on site. So Mars is inviting. But so are three or four others moons of the major planets. I'm very eager to find out what if anything is under the ice layer of Enceladus. Because I've been into emergence theory a lot recently, and emergence theory looks at the nature of cosmic evolution from the big bang to the foreseeable future.

BOYNTON: What about a lunar base? Going back to the Moon?

SWENSON: Well, there's an awful lot of the Moon we haven't explored yet. To find out whether there might be glaciers at the limb, the edges where light and darkness mingle, especially on the back side of the Moon—if that should be the case that there would be some sort of H2O there, it's like the recent excitement on H2O, water, residual water anyway, on Mars.

BOYNTON: Yes. There's no water on the Moon, Loyd, forget it. Here's the thing. One of the real disappointments of Apollo—

SWENSON: Where did life come from, John? There's a lot of very intelligent people say it's panspermia that comes from meteoritic bombardment from outer space.

BOYNTON: There's some kind of oxygen.

SWENSON: I think that's the number one thing that we learned during the decades of Mercury, Gemini, and Apollo, was about the big picture. The big picture is that there are organic molecules in outer space. The universe is pervaded with methane and all the thanes. Those chemicals that only have a slight signature, but they're there. Everywhere. So that makes me really believe in SETI also; Search for Extraterrestrial Intelligence is not a will-o'-the-wisp. It is something we are bound and determined I think to do because we may not be alone.

BOYNTON: See, that's where we differ.

SWENSON: Might be intelligent cockroaches. God knows.

BOYNTON: We're not going to get signals from space that are decipherable. But let me just say something about the Moon. One of the real disappointments of Apollo was that we didn't find out anything really Earth-shattering scientifically. There's no seismic activity.

SWENSON: Except to settle the argument as to where the Moon came from.

BOYNTON: There's no volcanic. There wasn't anything, some rare earths or rare elements. Now they think there's some way that you could get oxygenated something out of the regolith. But to send a factory up there and get it running and mine this stuff and then send it back, to me, is a false economy. That would cost so much more than what we could do on Earth. So I don't think there's any justification for now going to the Moon. Now 35, 40 years from now yes, it'd make a great science station. They've talked about putting something on the far side so it's a perfect telescope.

What's really interesting is Mars. Even if there is no life-forms on Mars, just to go there and see why it's different from Earth and why it has these winds and why it has dust storms. They can land on one of two Mars satellites.

But I maintain—and this was my paper two years ago, exactly two years ago—I maintain that you get more science from say an eight- or nine-month orbital mission, coasting in orbit for eight or nine months. You can even maneuver in that orbit, you can even change that orbit with enough thrust. Send probes down. Probes are cheap. If probes crash, you don't kill anybody. The nice thing about having an orbital mission where you send down a whole bunch of cheap probes is you can choose your landing sites and you can change in real time. You can't say, "God, I wish we'd gone to the North Pole."

When you land with the men, they're not going to be able to go very far. They might have a little helicopter kind of LM. They might even have their own little roving vehicle. But you're still going to be limited to ten or 15 miles. What if you make a mistake? What if you thought all this great science was in this one place you landed, and it was nothing?

That's basically what we did on the Moon. We thought we were going to find out all kinds of stuff. We didn't. So we should go to Mars because it will inflame the imagination of the American public. It'll cause kids to go to school and say, "I want to learn and become a worker in this," like I did. We should definitely definitely at least have parallel programs. That's what I wrote to Mike [Michael D.] Griffin, is, "If you're going to have a lunar program and then Mars afterwards, let them go together." The nice thing there is if the Chinese start to get really rambunctious and, "We're going to go to Mars," we've already got something started. Maybe we could get them to cooperate with us rather than having a Space Race.

SWENSON: Shall I tell her about our international conspiracy with regard to China?

BOYNTON: What's that? Yes, that's right. I wrote a letter.

SWENSON: In 2001, I took a trip with Elderhostel to China. Beijing first, and Xi'an, and Kunming mostly in Southwest China in February. John asked me to take one of his papers along.

BOYNTON: I'd just gotten married to a Chinese lady.

SWENSON: So I did. Sure enough, at a cocktail party one evening I got with a bunch of technical people. I'm not sure that they were directly in the Chinese space program or not. But I got them interested enough to actually—

BOYNTON: He gave them my letter.

SWENSON: The primary idea of the letter was encouraging the Chinese to go for manned spaceflight and go for Mars. With his particular version of how to get there.

BOYNTON: Well, let me make a comment now that he's introduced that. I'm really selfish. By the way all humans are selfish, it's built into our genes, we're selfish for survival reasons. But I'm selfish. I would love to have a Mars program while I'm alive. The way it is now, Loyd and I aren't going to be here, if they ever do go to Mars. Now we can do it in ten years. Maybe Loyd and I could hang on for that long. But back in '91 when George Bush, Sr. had come out with his

little new initiative, it was so vague and so unpointed and so wishy-washy that I said, "We're never going to go to Mars. I'm going to write a letter to the Chinese; they've got the wherewithal and they've got the political environment to actually do it."

I wrote this two-page letter and said, "Dear Chinese people," or whatever it was. "I used to work at NASA." Blah blah blah. "We really need to go to Mars, and the Americans aren't going to do it. Why don't you do it?" I don't know whether it ever went to anybody that was important or not. But they're working on a very intense space program. We don't know what their objectives are. But I'll bet you Mars is one of them.

Wouldn't it be funny if five or six years from now we're sitting here, and they launch to Mars, and I say, "I was the one that got them to do that?"

WRIGHT: Or a contract historian is asked to do a program history of the Chinese and finds that letter? That'd be quite an interesting conversation.

BOYNTON: Some Chinese guy says, "And this was wonderful. Who sent this? Do you know this guy?" Loyd would say, "I don't know him, I never met the guy, where'd you get that letter?"

No, the sad thing is, Rebecca, you run into people on the street and they don't even remember what Mercury and Gemini and Apollo are. They say, "Gemini? What was Gemini?" They really know nothing about the space program. But they say, "Why don't we go to Mars?" It's the planet that's the safest place to go. We don't have to go through the asteroid belt. It's not a high radiation environment, it's a place we could send guys right now.

SWENSON: Relatively safely.

BOYNTON: Relatively safe. By the way, the biggest problem with going to Mars, 25 years ago we had the technology to go to Mars. The only thing then was long term cryogenic space storage. So if you had propellants, were they all going to boil off before you got there? Now we've got that problem solved, because we have different ways of getting thrust. The other problem was cosmic radiation. If you go out into space there's radiation all the time, and we're protected by the Van Allen belt.

But that could be solved. It could be solved in several ways. Loyd and I got to talk to a guy up in Brookhaven National Lab. Funny that Loyd and I were the two people that talked to him. His whole job was looking at the radiation environment for astronauts. So we talked about what do you do when you go to Mars. I asked him two questions, Rebecca. This gets into NASA suppressing stuff, you asked that question before. I said, "Some people are more subjectively hurt by radiation than others." You know the guy that was in Hiroshima and Nagasaki? He left Hiroshima after the bomb.

SWENSON: News item just several months ago. One character.

BOYNTON: "They blow up another bomb and now what are they? Trying to get me?" Anyway, he obviously was not as affected by radiation. I said, "Why don't we send astronauts that have less susceptibility to radiation?"

He said, "That's discriminatory. Maybe somebody's highly qualified but they happen to have susceptibility. The public would scream about that."

I said, "I don't think so." Then I said, "What about people who are willing to make a one-way trip?" So they get fried cosmically. They're making a contribution to science. There's a lot of people that would do that. There's a lot of people who would go to Mars and land and not come back. They know they weren't coming back.

He said, "We can't do that." So I think there are ways to protect them so they don't come back fried.

SWENSON: Speaking of that, seeking eternal fame, I was deathly afraid that the Apollo 10 astronauts were going to say, "To hell with it. We want to be first on the Moon."

WRIGHT: Oh, that's interesting.

BOYNTON: Oh yes.

SWENSON: "We're not going to follow orders and come back when they tell us to." But he doesn't think that that was even in the cards. These guys don't think that way. They're too military. They're too trained to do the job according to nominal procedures.

BOYNTON: Rebecca, when we talked before, did I tell you the story about Neil?

WRIGHT: Yes.

BOYNTON: That's such a neat story because I'm totally convinced he would have landed. Now Chris Kraft would have chewed him up from one end to the other when he got back, and, "You son of a bitch, you do what I say." But Kraft would have applauded to.

WRIGHT: Well, we're almost out of time today. But I wanted to end on a reflection from both of you that you have been involved with the space history in different ways. Again, John, you lived part of it, and Dr. Swenson, you collected so much of it. What did you feel was probably the greatest lesson we've learned from having a civilian space agency?

SWENSON: Where there is no vision, the people perish.

BOYNTON: Loyd is a historian of the old explorers, the Columbuses and the Magellans. I'm not, obviously. But that was a great time in world history. A whole new land. People were discovering we had a round planet. We could go all the way around. That was an amazing time for the people on the street. Well, the same thing has happened with Apollo.

SWENSON: You've heard of Zheng He? The Chinese Muslim admiral of the ocean seas who just 50 years before Columbus took, over a 30-year period, seven major expeditions, Chinese junks so big that they were about the size of small aircraft carriers today.

WRIGHT: Actually, the chief historian has published a paper talking about the exploration of that time.

SWENSON: That was almost entirely unknown out of our culture until about 10, 20 years ago at most. None of the history books. That event, had it not been suppressed, they thought it was more important to stop these tribute vessels going over and bringing giraffes back. But anyway, the fact that we knew nothing about this and the Chinese did, but the Chinese suppressed it because they were having too much trouble with the Mongols and had to invest more in the wall and less in expeditions. I think that tells us an awful lot about the nature of the decision-making we're facing right now, with regard to how much risk to take and what the best analysis of payoff is going to be. Or if not payoff, the risk assessment.

WRIGHT: Any closing thoughts, John?

BOYNTON: I want to just say that [Harold Evans] wrote a book called *The American Century.* But the thought is that the 20th century is characterized by what the Americans did. World War II, and then going to the Moon, and industry, and technology, and just a rampant economy. We were doing what the Chinese are doing now economically. We were making money hand over fist and selling things to everybody else. Then suddenly the Japanese came in and started selling. But it was the American century. A really big component of that was the space program.

I went to Europe in 1969. The only time I went out of the country. I was a hero. Everybody I told, right after the Apollo lunar landing. "What do you do?"

"Well, I work at NASA."

"Oh, really." I was suddenly God. So yes, it was a great contribution just socially, sociologically.

But one thing I want to cover before we finish, because we got to wrap up pretty soon, is I wanted to ask Loyd and then give my own opinion of what the long term prospects of space travel are, because you have so many people voicing opinions that I think are just totally—I've already expressed one. I don't think we're going to get intelligent communication from space. Because we're talking about vast infinite space. I'm sure there are people out there, but I don't think we're ever going to hook up with them.

But I want to ask Loyd. Then I will answer. Do you think we'll colonize anyplace outside of the Earth? The Moon or libration points or Mars or any other goddamn place?

SWENSON: Well, what do you mean by colonize?

BOYNTON: Just start a whole new colony of humans.

SWENSON: When you look at the history of exploration and discovery of the Western Hemisphere alone, there's 150 years of probing. Trying to find out where salt water meets freshwater. Trying to find out whether this estuary leads into a bay or a river or what. Taking natives back, teaching them English, and then bringing them back on the next voyage and setting them down, Squanto. He'd spent something like seven or eight years in Europe and Africa before back to New England in time for the Pilgrims to arrive and ask him how to plant corn seeds.

BOYNTON: But the question is will we colonize space.

SWENSON: Well, what I'm saying is that colonize is too big a word. Visitation to begin with, after robotic exploration. Then little by little human planting feet hither and yon, picking up rocks, sniffing the atmosphere.

BOYNTON: But that's scientific.

SWENSON: Well, John, I'm saying that you got to go at it incrementally. History of exploration and discovery is an incredibly complicated thing, and to colonize means the end product of 100 years or more of these incremental steps. That's my opinion. I think we're going to do it eventually.

BOYNTON: Let me offer a comment. This may happen. You and I won't be alive when it happens, even Rebecca at your youthful age. But maybe someday 200, 300 years from now, and I'd like to bat this around with people like Fred Ordway, we may have relatively peace on the Earth. We don't have Iranians and North Koreans, you don't have people that are suddenly going to blow us up. But the possibility always exists. The possibility exists of biowarfare at any time, because anybody can come up with a bug that we can't—but I really think all the countries could get together like the UN [United Nations] and say, "Why don't we start a colony in space? Only for the purpose of making sure mankind survives." I was talking to Loyd in the car. There's this place up in Finland or Norway or wherever it is where—

SWENSON: Spitsbergen. Islands off the north of Norway.

BOYNTON: They're putting all these millions of different seeds into the ground.

SWENSON: Sperm bank you might call it.

BOYNTON: Species of flowers and vegetables and whatever. So that if there was ever any catastrophe, we could restart those things. Well, they may start doing that with human genes, I don't know. But wouldn't it be nice to have a colony in space that was totally independent of the Earth? They didn't need anything from Earth. They had a recyclable environment. They were there strictly for the purpose of if everyone on Earth blew each other up, or they all died of some horrible disease, the people in space would still survive.

Now, they might actually do that. But I go to conferences. In fact that's what the National Space Society—every year they have a space commercialization conference, and that's where I gave my paper on Mars. There's always people there that say we should colonize space because we're running out of space on the Earth. That's not the way you solve the population problem, because then you just transfer it somewhere else. We're not going to colonize space because we're running out of space on the Earth.

SWENSON: Okay. I get the last word.

BOYNTON: Yes, go ahead.

SWENSON: Two words. Pax vobiscum. Peace be with you and us.

WRIGHT: Amen.

SWENSON: Okay. Can we quit now?

WRIGHT: We'll close for today.

[End of interview]