

## ORAL HISTORY 3 TRANSCRIPT

RICHARD S. JOHNSTON  
INTERVIEWED BY SUMMER CHICK BERGEN  
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BERGEN: It is November 3, 1998. This oral history with Richard Johnston is being conducted at the offices of the Signal Corporation in Houston, Texas, for the Johnson Space Center Oral History Project. The interviewer is Summer Chick Bergen, assisted by Carol Butler and Kevin Rusnak.

Thank you for coming and sharing with us.

JOHNSTON: Happy to be here.

BERGEN: Let's talk about your participation in Gemini today. I was hoping you could explain, by the time of the beginning of the Gemini Program, what were some of the issues that the Crew Systems Division was responsible for.

JOHNSTON: Crew Systems was responsible for the life support system, for the EVA [Extravehicular Activity] system. I'm trying to think of the other things. A lot of other things. A lot of other things.

BERGEN: What were some things that you learned from the Mercury Program that you were able to—

JOHNSTON: Pass on?

BERGEN: Yes.

JOHNSTON: Oh, gosh, that's kind of hard to say. We were responsible in the Mercury Program for the life support system. We had an animal program, medical instrumentation. A lot of stuff. And I think really we kind of took that stuff and kind of let it roll into the Gemini Program.

BERGEN: Were there any things that you learned in the Mercury Program or learned that were not necessarily good things to do that you did carry over into the Gemini Program?

JOHNSTON: I can't think of anything.

BERGEN: Why don't we, as we go through the Gemini Program, just take mission by mission and look at some of the advancements that were made in each mission. We can start with Gemini III, with [Virgil I. "Gus"] Grissom and [John W.] Young. What did you take from any of the unmanned missions in Gemini and apply to Mercury?

JOHNSTON: We really didn't take much from the unmanned part of the thing. I think really the unmanned part was more a demonstration they could put the thing up and bring it back. So I think in Gemini III we were mainly evaluating the life support system, their space suits, their medical instrumentation, and food system. There was a lot of things like that. It was a very successful mission. One of the things that got the crew in trouble, they smuggled a sandwich on board.

BERGEN: And that didn't make Crew Systems very happy?

JOHNSTON: It didn't bother me. [Laughter] No, it didn't bother me. It bothered some people at the [Johnson Space] Center, but it didn't bother me.

BERGEN: They also had a mishap that resulted in a broken faceplate, for Grissom, and a scratched one for John Young. What kind of changes did you make in the space suits to prevent something like that from happening again?

JOHNSTON: I think we went to Lexan visors, as I recall. I don't know exactly why Gus broke his visor. That spacecraft came down, and then when it hit the water, it flopped over. I think that's when he broke it. So I really can't tell you any more than that.

BERGEN: How were the space suits for Gemini different from the ones used in Mercury?

JOHNSTON: First of all, they were made by a different contractor. They were made by David Clark [Company]. They had a different ventilation system, and they were just different suits. The Mercury suit—I went to work for the Space Task Group back in about '59 or '58, I don't know what year it was, anyhow, when I went in there, they asked me to take care of the environmental control system and I said okay. After I was there about a month and a half, nobody was taking care of the suits. So I went to Max [Maxime A.] Faget and said, "Max, you know, nobody's taking care of these space suits. I was out at Wright Field [Wright-Patterson Air Force Base], and they're trying to ram a David Clark suit on you all, and that's not compatible with the environmental control system."

He said, "Well, what do you want to do about it?"

I said, "I think we ought to evaluate the B.F. Goodrich suit and the ILC [International Latex Corporation] suit."

He said, "Let's go talk to [Dr. Robert R.] Gilruth."

So we went and talked to Dr. Gilruth, and he said, "If that's what you think we ought to do, go do it."

So I went out to Wright Field and I said, "Guys, I've got some announcements to make. First of all, we're going to evaluate two other suits as well as yours."

Well, that really got those guys mad. [Laughter] They climbed all over me, got me in a circle, just pummeled me with stuff. I took it for about fifteen or twenty minutes and I finally said, "Look. I'm not taking this off you guys. If you don't want to evaluate the suits, that's fine. I'll go someplace else."

So anyhow, we brought all the suits in and they evaluated them. And guess what? They picked the David Clark suit, which was not the right suit. So we got the report, and I told Max about it, and I said, "Max, this is not the right suit. It's incompatible with the life support system."

He said, "Well, what do you want to do?"

I said, "Well, let's go talk to Gilruth and then we've got to go over and talk to the crew."

Well, that meeting with the crew was just unbelievable. But anyhow, we said, "Look. We're going to pick the B.F. Goodrich suit." And, boy, the Air Force guys just went ballistic. So I was there for about three hours, getting pummelled by those guys. But that's what we ended up doing. That was an interesting part of my life, it really was.

BERGEN: So in Gemini, you did decide to go with—

JOHNSTON: In Gemini, we did go to David Clark.

BERGEN: What changes had they made by that time?

JOHNSTON: They had a different vent system and they were doing something that was compatible with the life support system. They only paid \$5,900 a suit for the Mercury suits, believe it or not. You know what they're paying now for a suit? A lot. A lot. But anyhow, we flew it, and it worked fine.

BERGEN: The next mission was Gemini IV. That was interesting because of the first American EVA.

JOHNSTON: I tell you how that all happened. George [M.] Low came back from the Cape [Canaveral, Florida], and about a week before we launched Gemini III, the Russians had gone EVA. Low called me and Chuck [Charles W.] Matthews and Deke [Donald K.] Slayton over to his office and he said, "Can we go EVA on the next mission?"

I said, "George, I don't really know, but if you want us to, we'll try to do it."

He said, "I don't want anybody to know we're working on this."

I said, "Okay."

He said, "I want your division to handle the life support system and zip gun."

I said, "Okay." This was like on a Wednesday or Thursday. So I got all the guys that worked on the things together in my office on Friday and we designed the thing on my blackboard. I walk in his office on Tuesday morning with a mockup of the whole damn thing.

Low said, "This is great. I don't want anybody else to know we're doing this."

[Laughter]

I said, "Okay."

But he said, "You've got to keep track of who knows."

I said, "All right, I can do that. But I've got to tell you something I need. When I call the procurement office, I don't want to hear a lot of nonsense out of them about sole-source

memos, blah, blah, blah, and all that. If we're going to get this done in two months, I've got to have the support of the people in the administration side. I don't want to be arguing with them and whatever."

He said, "Okay, I'll take care of it."

So we went about it, and in two months we built the damn thing, and we went through all the chamber tests and did everything. In fact, that's the only crew that came into my office on the way to the Cape. Ed [Edward H.] White [II], what a great guy he was. Jim [James A.] McDivitt. And thanked us for what we did. And it was a super EVA, really was. I've always felt bad Ed White burned to death in that Apollo fire, because he was one of the best astronauts I know, he really was. Nice guy.

But anyhow, we didn't tell anybody about it in headquarters for a long time, and finally George [E.] Mueller and, I guess, Bob [Robert C.] Seamans [Jr.] were down at the Center when they called me to come over and give them a briefing, and I did. I'll always remember George Mueller said to me, "Boy, you're never going to have that thing ready."

I said, "Well, you watch us."

So we got it all finished up, and I had to go up and give a briefing to the administrator of NASA and a couple of other people, and they flew a plane down, a jet, down to Ellington [Field], picked Dr. Gilruth and Chris [Christopher C.] Kraft [Jr.] and I up and took us down to the Cape, and we popped it on the press the day before launch.

BERGEN: Why did George Low want to keep it a secret for so long?

JOHNSTON: I don't know. He never told me. I never asked him. I figured he must have his reasons. Why the hell should I ask him? George Low was an extraordinary man. He was one of the better managers that we had, he really was. I figured he must have his reason. But, you know, after the Gemini IV, there wasn't any awards passed out. Nothing. Which

always surprised me. It didn't upset me. I mean, I think all of us that worked on it got our thrill out of seeing the damn thing go. But we really did a lot of work. The shop did a lot of work. I have the backup unit sitting in my bookcase at home. When I left Crew Systems, they gave it to me. But anyhow, it was great.

And I'll tell you something else. After the thing was over, the crew was, I guess, out in the Atlantic on a carrier, and I think it was NBC had a booth up on top of what used to be the old Nassau Bay Hilton or Nassau Bay Hotel, and they wanted me to come over and narrate the film, which I did. My mother and father were going through a department store up in Washington, DC, and my mother looked up and she said everywhere she looked, she saw me. That was a big thrill. Unfortunately, she's dead and my father's dead. But anyhow, that was rewarding.

BERGEN: You were designing the unit for the EVA. Would you have run into any significant problems in the development of that?

JOHNSTON: No. I'll tell you what we did. We took things that we could get from the Mercury ECS [Environmental Control System] and the Gemini ECS and we designed the thing around those components. The thing worked great. It really did. I guess of all the things I ever did while I worked in Crew Systems, that was one of the best, because we did it in house and we didn't tell anybody we were doing it. I kept a list of everybody that knew about it. We finished it up.

BERGEN: Did the zip gun work as you anticipated?

JOHNSTON: Yes. In fact, I went over to Paris [France] after that mission, to give a paper at the IF, and I was getting ready to go, and somebody said there was a guy named Don

Flickenger [phonetic], a general in the Air Force, and he had picked a copy of the film up, and it really irritated me, so I called him in Paris. I said, "Don, I understand you've got a copy of the Gemini IV EVA."

He said, "Yes. Why?"

I said, "I'm giving a paper and I'm going to use that film, and I'd like you to put that back in your suitcase and leave it there." He didn't know what to say. So anyhow, that's what happened.

BERGEN: Then the next mission was Gemini V, which was an eight-day mission, which at that time was the longest mission that we'd performed. What type of changes did Crew Systems have to implement to accommodate an eight-day mission?

JOHNSTON: For one thing, we made different suits for them. Was Gemini V the fourteen-day mission?

BERGEN: I believe it was an eight-day mission.

JOHNSTON: We made a soft suit that the guys could take off, they could doff. As I recall, it was Jim McDivitt and Frank Borman flew that mission. Who do you have down there?

BERGEN: Gemini V, [L. Gordon] Cooper [Jr.] and [Charles C. "Pete"] Conrad.

JOHNSTON: No, I don't remember them going eight days. Maybe they did.

BERGEN: Borman and [James A.] Lovell [Jr.] went fourteen.



JOHNSTON: That's where we made the soft suit. I don't know what I can tell you about the Gemini V. We had suits that David Clark had built, and that's pretty much what they flew. And the food system and everything else was like we had done in Gemini IV. It was kind of an uneventful mission.

BERGEN: In [Gemini VII], there was some disagreement about whether the astronauts should keep their suits on the whole time or could take them off. Were you involved at all in that discussion?

JOHNSTON: Yes.

BERGEN: What did you think?

JOHNSTON: I thought they should take the suits off. I mean, if you're going to be up there for fourteen days, you sure as hell don't want to sit around in a suit that's—you can't sweat, you can't do anything. So that's the reason we built some soft suits that they could doff and put on when they needed to, and that's what we flew. We developed those in, gosh, I don't know, five or six months. I had a real group of people working for me in Crew Systems. We could do anything.

BERGEN: If we move to Gemini VIII, that was the one with [Neil A.] Armstrong and [David R.] Scott, where they had the thruster malfunction and the spacecraft was rolling. Did Crew Systems learn anything about the way men handle emergencies in space from this incident?

JOHNSTON: Not really. We didn't really. I think really the problem with that mission was more with the system that controlled the attitude of the spacecraft. I think they did a good

job of straightening it out and bringing it in and landing it without any trouble. But, no, I didn't learn anything from it.

BERGEN: Gemini IX with [Thomas P.] Stafford and [Eugene A.] Cernan had problems on the EVA. Can you tell us about that incident?

JOHNSTON: I'll tell you what. We had built a maneuvering unit which we had located in the back of the spacecraft, and what Cernan had to do was to go out and go around to the back of the spacecraft and pick this thing up. For some reason, he ran into some troubles and he couldn't get back in and pick it up, so he never did use the maneuvering unit. He just couldn't get back there.

I think we learned a couple of things from that. Number one, we didn't have enough handholds and restraint systems and so on for him to go back there and pick the thing up. And that was not Crew Systems' fault, that was the fault of the people building the spacecraft. So I always felt bad about that, but I didn't feel responsible for it in any way. I had nothing to do with how the back of that spacecraft was built.

BERGEN: Cernan also had problems because he was working so hard that his suit and the visor fogged up. What kind of changes did you make in future EVA suits so that that sort of thing didn't happen?

JOHNSTON: I don't think we really did anything for the Gemini suits. Unfortunately, when he exerted all this energy, he started sweating and the sweat condensed on the visor and it went on from there. The suit caught a lot of static about it, but it really wasn't the suit; it was the way the handholds and things built back in that part of the spacecraft so that you could go

back and retrieve that maneuvering unit. So I never felt responsible for anything like that. None of the people working for me did either.

BERGEN: Did you participate in any way in training for EVAs?

JOHNSTON: People working for me did, sure.

BERGEN: Because by Gemini XII, Aldrin had incorporated underwater training.

JOHNSTON: That's right. In fact, I think really as a result of Cernan's problem, we started training the astronauts in a water tank, doing tasks like they would do when they were in flight. It ended up being a worthwhile way to train people to do EVA. You've got to understand that when we first did EVAs, it was something totally new, and the people doing training didn't really have the proper things to train people to do the EVAs. Those people worked for a guy named Warren [J.] North. But I think that the experiences we had in Gemini taught us a lot about how to do EVAs, so it all worked out before it was over with.

BERGEN: What were some things that you learned in Gemini that you were able to apply in Apollo?

JOHNSTON: For one thing, we learned that if you're going to send somebody outside the spacecraft, you've got to have restraint systems and things that they can get a hold of to go move about the spacecraft, which we did in Apollo. I guess really that's the biggest thing we learned. Cernan probably did as much as anybody to get us started in the right way.

BERGEN: Did you have people working on Apollo at the same time as working on Gemini?

JOHNSTON: Yes.

BERGEN: Did you do anything to promote communications between them?

JOHNSTON: Oh, yes. I had regular staff meetings, and they compared notes on what they were doing for the Gemini suit and the Apollo suit and so on.

What made it difficult then, we were supporting two programs. An awful lot of our energy went into the Gemini Program because it was happening. I remember one day I went out to [North American] Rockwell, and I was flying back with Joe [Joseph F.] Shea. He was sitting next to me. He started on me, and I took it for as long as I could, and I finally said, "Joe, will you just shut up. We're doing everything we can for you and your program, but get off my back." He never, ever bothered me after that. I liked Joe Shea. He was okay, but he was very arrogant. I shouldn't say that, I guess, but I did.

BERGEN: After Gemini, then you went into Apollo. You talked extensively about Apollo 1 before, so maybe we can start with Apollo 7. How did you feel about the quality of the Block II command and service module (CSM) before Apollo 7 went up?

JOHNSTON: Are we going to talk about Apollo now?

BERGEN: Yes, if that's okay.

JOHNSTON: Okay, that's fine. The quality of the command module (CM) was extremely poor. That's all I can tell you. I remember the day the fire happened. I was home and I got a call to come out to the Center. Those three guys all burned. We had 100 percent oxygen

environment, but they had stuff in that spacecraft they shouldn't have had in it, just shouldn't have. In fact, that night I went down to the Cape with Joe Shea and some other people on the Gulf Stream, and that was a terrible part of my life, I tell you. I guess the one thing we learned out of all that, we got a new dedication to trying to straighten out the Apollo Program.

Joe Shea really had a breakdown, and I remember I went down there. I used to have to go down and give briefings to the Accident Board. We were down there one day and we were waiting on Joe Shea, and Joe didn't come in and he didn't come in. Finally he came in, and he started going through his briefing. Dr. Gilruth was there. He started explaining this one chart. Gilruth said, "You're not explaining that right, Joe. Don't worry about it."

So the next day I'm sitting behind the old man, and Joe Shea gets up and starts explaining this thing just like he did in the dry run. I could see Gilruth getting red in the neck and the ears. He got up, took the pointer away from Joe. He said, "Let me explain this." And that was the last briefing I ever heard Joe Shea give. He really kind of cracked up. He moved on to headquarters and then went on into industry, and I don't see him much. He was okay, but he was—well, I don't think he was a good manager. I don't think he treated people right. There were a lot of things about him that I didn't like. I'm being very honest now.

BERGEN: You said after Apollo 1, you had a new dedication to making sure that all the programs went well. How did this affect the Apollo 7 mission?

JOHNSTON: The Apollo 7 mission. Well, you really can't talk about how it affected the Apollo 7 mission. What you've got to think about is what did we do in the way of bringing new materials and improving the safety in the spacecraft. And we did a lot of things. We brought beta fabrics in. We teflon-coated the outer covers of the space suit. It was just a lot of things like that, just a lot.

I know I came back from the Cape, after I'd been down to the fire, and I got all my division together and I said, "We've gone through a terrible thing, but what we've got to do is rededicate ourselves to getting this straightened out. And we're going to do it." And we worked our butts off getting it done. Really and truly, we did a lot of things that really made the spacecraft very safe, very safe. I've never felt bad about—I did, I felt terrible that those three guys were burned to death. If they hadn't burned to death, I'm not sure how Apollo would have ended up. And, you know, we were back flying in less than two years. So that was a tough period in my life, it really was, and I worked day and night. Day and night.

I got to know Dr. Gilruth a lot better. In fact, after I guess we had flown one-man flight or we were getting ready to, but he called me one day and asked me if I'd come over and be his special assistant, and I really wasn't wild about doing it. But I went home and talked to my wife. I said, "If the old man wants me to do that, I ought to go do it."

So I called him the next day and went over to talk to him, and I went over as his special assistant. That led me to managing the Lunar Receiving Lab, because it was in trouble. He called me one day and said, "That lab is in terrible trouble. Go over and straighten it out."

BERGEN: What kinds of problems was it having?

JOHNSTON: [Laughter] I wouldn't know where to start. First of all, we had a group of physical scientists and medical scientists, you know, life scientists. They didn't even talk to each other. They wore different color suits. But I went over. I got everybody together in a big conference room they had over there, and I said, "Look. I didn't ask to come over here, but I have been sent over here to get this place straightened out. I'm going to do it, and you're going to help me."

There was a guy named Jerry Wasserburg [phonetic], who had a pair of sandals on, and I had a bright sport coat on. He made some smart remark about my sport coat, and I looked down and he had these sandals and no socks. I said, "Look. Any son of bitch that doesn't have no sense to wear socks oughtn't to be making any comment about my sport coat." Well, from then on, he was like a friend.

They went over to talk to Gilruth a day or two after I went over there, and said they didn't think that was a good idea to send me over there. But when it was over, they said it was the smartest thing he ever did.

I brought a couple of people in, and I've never seen so many problems. Oh, what a mess. And I remember the last day, the crew was really on its way back and we were on one more dry running process in the film. I'm home and I get a call, and they said, "You'd better come out here. You're not going to believe what we did." They dissolved the film. True story. True story.

So I went out. I said, "Call the shop. Call the photo lab. We're going to get this straightened out." And we did, that evening.

I was over in the [Mission] Control Center the next day, and I was talking to Dr. Gilruth and I said, "I'm going to have to tell you something. I wasn't going to tell you before. But they melted the film last night, yesterday afternoon. But we've got it straightened out, so don't worry." I couldn't believe it. It was just one problem after another.

In fact, after Gemini XI was over, *Life* magazine invited me to take my wife and go to Hawaii and give a talk. I really thought about it, and I'll tell you the truth, I had worked so hard, I just didn't feel like doing it. So I called and told them that. I said, "I really don't feel like going." The girl couldn't believe I was saying that, because they were going to send us first class and put us up in a hotel, you know, blah, blah, blah. I said, "I have worked my butt off and it's over with, and I'm going to take some time off and I want to be with my family, because I haven't been with my family hardly at all. I hardly got a night's sleep that

somebody didn't call me with a problem." So the girl couldn't understand me doing that, but they got somebody else. And that was life. I probably missed a nice, good time, but I didn't really care about it. I did get invited to the State Dinner out in California, which was a super night.

BERGEN: You had some good perks, then.

JOHNSTON: Oh, yes. I think that Gilruth and some other people, they took very good care of me, because I was willing to step up and do the job that they wanted me to do, and they paid me back. There weren't too many guys at my level that got to go to that banquet, and it was some night. Some night.

BERGEN: When you were working in the Lunar Receiving Laboratory, there was the big concern about contamination. Can you tell us about that theory and what you did to try to prepare for that possibility?

JOHNSTON: Sure. I can walk you through it. But I tell you the truth, when I went over there we really hadn't thought through what we had to do. Just had not thought through what needed to be done. So I got the guys from recovery and the people who built the suits that the recovery people were going to use, and I took over as a spokesman with a thing called the Interagency Committee for Back Contamination. We wrote a couple of reports that we sent to them, and we met with them down in Atlanta, Center for Communicable Disease.

[Dr.] Chuck [Charles A.] Berry was still there. Chuck is a nice guy, but, boy, he can be a pain in the neck. I remember me flying down there one day and he was telling me what he was going to talk to the people about. I said, "Chuck, we're not ready to talk about that and I don't want you to bring it up." What do you think he did? He brought it up. So I



stopped him. I said, "Chuck, I told you on the airplane, you were sitting right across from me, that we were not ready to talk about that. You're embarrassing the whole group of NASA people by bringing that up." So I told the chairman, "I apologize for this. Dr. Barry is out of order." When we got back on the airplane, Chuck didn't know what to say to me. I liked Chuck Barry. Are you talking to him?

BERGEN: We haven't yet, but we're going to.

JOHNSTON: Well, you ought to have fun with him. [Laughter]

BERGEN: So you were manager of the Lunar Receiving Laboratory just a few months prior to and a few months after Apollo 11. What are your memories of Apollo 11?

JOHNSTON: Well, I really managed it for Apollo 11 and 12. All right? And I can't remember the month that Gilruth asked me to go over there, but I went over. As I say, I had never seen anything in such disarray in my life. I brought a couple of guys over with me. We got it straightened out, but it was a mess. It was just a mess. And the physical scientists and medical people were not talking to one another, you know. So I kind of got the team together, and we worked on problems. The paperwork was just, you know, terrible.

And one day I went down to the guy who was handling where they were going to store the lunar material. I said, "Would you show me where you're going to put that?" He was going to put it in his lab. I said, "You've got to be kidding me." He said, "No."

So I went to Gilruth and I said, "If it's okay with you, I'm going to get the shop and we're going to build a place to put the lunar material. That idiot's got this lab and he's going to take the material down there and leave it."

He said, "Dick, whatever you need to do, go do it."

So we built an interior—really like a vault, had wiring all around the thing, and fire alarms and everything. We did it in a couple of days. But I went down there. [Laughter] This is the way the whole thing went while I was over there. Everything I looked at was in trouble, and I don't know where the guy is that handled it. He went down to, I think, the University of Houston. But I couldn't believe what he was talking about. He was talking about taking this material that we'd spent millions of dollars going to the Moon, and he was just going to have it in his lab. Well, I told him, "That isn't what we're going to do. You may be the curator, but I'm the boss, and we're not going to do that."

BERGEN: In late 1969, you were moved from the Lunar Receiving Lab to the Apollo Lunar Experiments Program. Can you tell us what you did with that?

JOHNSTON: Well, I tell you what happened there. I really didn't like being Gilruth's special assistant. I'm used to hands-on kind of things. I was in the office one day and Jim McDivitt called me. He was now the Apollo Program manager. He said, "Hey, can you come down for a few minutes?" I said, "Sure." So I went down and he said, "Would you be willing to come down here and run the science experiments for the last three Apollo missions?" And I said, "Yeah, I'd be happy to, but I'm going to have to talk to Gilruth about it."

So I went up and saw Dr. Gilruth and I said, "You know, I've enjoyed working up here with you, but this is not my thing. I'm used to doing hands-on stuff, and this is not my bag."

So he said, "Well, what are you going to do?"

I said, "Well, McDivitt wants me to come down and work in the Apollo Program Office and run the science experiment development."

He said, "Well, if you want to do that, go ahead and do it."

So I went down there, and I guess I was there a couple of months and Apollo 13 happened, and I got involved in that accident investigation and stuff.

Then, I don't know, several months later, Gilruth and Kraft called me up to talk to me about the experiments for Skylab. And they talked and they talked, and they talked about Chuck Barry and they talked about the medical stuff. I said, "What the hell are you guys driving at? You want me to go down and straighten that out?"

They said, "Yeah. But we didn't know if you'd like to go work for Chuck Barry."

I said, "I don't dislike him. If I go down there, I'm going to run it. He isn't."

He said, "Whatever you want."

So I went down there and I took over the experiment for Skylab.

BERGEN: So then did you not work on the experiments for Apollo?

JOHNSTON: No, no. And, boy, I never saw such a mess in my life. You know, it seemed like everything I touched in that Center was in trouble. We straightened it out, but it was different.

BERGEN: So what were your thoughts when the Apollo Program ended?

JOHNSTON: What were my thoughts when the Apollo Program ended? I hated to see it end. It was a good program. I think we learned a lot about the Moon. We learned a lot about the effects on people traveling in space. I don't know what else I could tell you. I think that the science that was carried out was phenomenal, I really do. And I'm not a physical scientist, but I did get a degree in chemistry. The things that they did were, you know, great. In fact, we have reflectors and things I guess they're still using, are up there.

I don't know what else I can tell you. I think that Apollo was an extraordinary program, it really was, and if we hadn't had the Apollo fire, it would have been even more successful. The Apollo fire generated a new dedication, if you will, to making the thing go right. And all of us worked our rear ends off trying to make it happen. That was a terrible thing, to have those three guys burn to death. It really was. And I remember I was at the Cape. I went down to the Cape and I was down there for about a week or two after the fire, and there when they loaded their bodies on the airplane. I tell you what, I cried like a baby. It was sad. Because the guys that they did load on that plane, Gus and Ed White and Roger [B.] Chaffee, they were all good guys, they really were. But it was sad that they burned to death, you know. It was unnecessary. It really was unnecessary.

I came back with a new determination that we were going to do what we had to do to correct our part of the program, and we did. We did.

And I remember after the final report was in, I was home and Gilruth called me one day and he said, "I've got to go up to headquarters tomorrow. I'd like you to go up and review the report with me."

I said, "Do you really want me?"

He said, "Yes."

I said, "Sure, I'll do that."

So I got on the airplane, flew up there with him on Saturday, and spent Saturday, all day Saturday and Sunday, reviewing the report. He came in and he said, "What are you doing for dinner tonight?"

I said, "Really I don't have anything planned."

He said, "Well, why don't you and I go out and have dinner."

So we went out and we had a couple of drinks, we talked, and he said, "Would you mind spending the week up here with me?"

I said, "No, sir, if you'd like me to, I'll do it. I'll have to call my wife and tell her to send me some more clothes."

He said, "Well, why don't you do that."

So I spent the whole week up there, sitting behind him at the congressional hearings on that. We became very close as a result of the Apollo fire, we really did. He's in a retirement home now and I guess he's got Alzheimer's. I don't know exactly what he's got. But he was an extraordinary man.

George Low is an extraordinary man. In fact, if I had to tell you the three people who I felt were the most extraordinary, it was Gilruth, George Low, and Max Faget. They were just topnotch people, good, honest, square people that dealt right with you head on.

Kraft, he was okay, but he wasn't like them. Chris is not one of my favorite people. I guess that must show. But anyhow, that's the way it goes.

BERGEN: The Apollo Program was achieved by amazing people.

JOHNSTON: Yes.

BERGEN: Before we close, I'd like to see if Kevin and Carol have any questions.

BUTLER: I have one question for you. When Apollo 11 landed on the Moon, do you remember where you were and what you were doing?

JOHNSTON: Yeah, I was in the Control Center.

BUTLER: What were your thoughts at the time, or your feelings?

JOHNSTON: Well, it was, you know—we'd all worked so hard to get there, and when they landed and—what's his—Armstrong stepped out on the Moon and made the statements he did, and they put those experiments and things up, it was a combination of a hell of a lot of effort by a lot of people, and we were all just very pleased. It was too bad that we had burned three guys to death before we got it done. You know, if I have to look at Apollo and say what was the bad part about Apollo, the bad part about Apollo was the fire and burning those three guys to death. I think that that gave us all a new dedication to doing what was right for the balance of that program, and we didn't have any problems after that. We really didn't. And I'm not sure Apollo would have been too successful if we hadn't had that fire.

Unfortunately, while Apollo was being developed, we were flying Gemini, and an awful lot of the better people in the Center were working on Gemini, not on Apollo. But once the fire occurred, then there was a new emphasis at the Center on all our parts to work on Apollo and make sure it was right, that we didn't have fire hazards, that we didn't have blah, blah, blah, you know.

So I felt, you know—I was over in the Control Center when they landed on the Moon, and I felt a certain elation to that. I really did, because we'd worked our butts off to get them there, and we did it. We did it. So, you know, whatever happened after that was like candy.

But Apollo 11 was a culmination of a lot of hard work. Really was. And the guys who flew it were great people. Neil Armstrong and Buzz [Edwin E.] Aldrin—Buzz Aldrin was kind of flakey, but the other guy with them—was that—God, I can't think of his name now.

BERGEN: Mike [Michael] Collins.

JOHNSTON: Mike Collins. Mike was one of the best guys I've ever known. And they did it. We all did it.

BUTLER: Absolutely. It took everybody to make it happen.

JOHNSTON: Yes, yes. You know, we brought them back and put them into quarantine for, I guess, twenty-one days. I've forgot. But they all said—in fact, most of the crews who landed on the Moon and had to go into quarantine for three weeks really thought that was the best thing that ever happened to them, because it gave them a chance to unwind and to sit down and chronicle their thoughts and write their memoirs and do whatever they wanted to do without a lot of press people and whatever bothering them. Now, they were happy as hell to get out of there, but I think that they were a good crew. As I say, Aldrin was probably the only flake in the group, and he still is.

BUTLER: You've talked about the Apollo fire, which was a great tragedy, and then Apollo 11, which was such a triumph to come back and make it all happen. Then you mentioned that you worked on the Review Board for Apollo 13 when their accident occurred, is that correct?

JOHNSTON: Yes.

BUTLER: We didn't talk much about that. Can you tell us a little bit about what you—

JOHNSTON: I was working for Jim McDivitt in the Apollo Program Office then. In fact, I'd taken my family down to see the launch, and they wouldn't let my son in, which just irritated the hell out of me. But we were out along the island and we watched the thing go. We got in our car and started driving back home. When we were about an hour and a half outside of the Cape, we heard that they had this problem. So I told my wife, I said, "Honey, we're

going to have to drive right straight home, but we'll stop somewhere out along the edge of the Florida peninsula, but I've got to get back to the Center."

So I got back within about a day and a half. There was a lot of apprehension about how we were going to take care of those guys. As it ended up, it all worked out, but there were a lot of scary moments, you know. We weren't too sure how they were going to get them back. I think Jim Lovell and—God, I'm trying to think of the other crew members. Jim Lovell and—I can't think who it is right now. But they did a great job. They went on up and went around the Moon and fired the rockets and got themselves on the way back home, and they recovered and everything was great. So I guess we all learned something out of that.

I tell you what the biggest problem was. In the oxygen tank, after the Apollo fire, we took care of almost everything, but nobody did anything about the tank, and there was a spark in that tank which went off and blew out the side of the service module. The crew, you know, was kind of left hanging. They didn't know what they were going to do. So, you know, we got things organized, and I think that the guys in Crew Systems figured out how they could take the lithium hydroxide cartridge out of the command module and tie it into the LM [Lunar Module] ECS, and the thing worked fine, you know. There were a lot of things like that had to be done, and the crew handled themselves real well. Whipped around the Moon and fired the rockets and were on their way home, and they picked them up. I'm trying to think of the guy who got sick.

BUTLER: Fred [W.] Haise [Jr.]?

JOHNSTON: Fred Haise. But, you know, we brought them back and they were fine. But it was touch and go for a lot of things.



BUTLER: Luckily you were able to help get them back successfully, and it all worked out and the Apollo Program went on.

JOHNSTON: Yeah, yeah. I think, as a result of that fire, though, they went back and redid those tanks, because we didn't fly Apollo 14 for probably six months after that.

BUTLER: I have one last question that's a little bit off our topics for today, but in the light of what's going on up in space right now, John [H.] Glenn [Jr.] is flying aboard the Space Shuttle. You worked with him during the Mercury Program.

JOHNSTON: Yes, and I worked with him before he was an astronaut.

BUTLER: Do you have any thoughts on his space flight right now?

JOHNSTON: I'm real pleased for him. John Glenn was probably the—I guess if I had to pick the guy who was the best astronaut in the original seven, he would be it. Al Shepard would be second. But John, you know, he flew. I think that President [John F.] Kennedy told them not to fly him anymore. I don't know. Somebody did, because he never flew again. John has gotten to be a bit arrogant, but that's all right. He's been a senator for three terms. Wherever he goes, he's worshipped. I really like him. I really do.

He was at the Bureau. I worked at the Naval Research Lab for a number of years and then I decided I ought to go do something else, so I went to work down at the Bureau of Aeronautics, and that's where I met John Glenn. John was the FAU flight desk officer. That's when he set the transcontinental record flying that plane from California.

He is a real smart guy and he's also very friendly. I don't know what else I can say. I'm pleased for him, and I hope that everything goes okay and they land and he comes back and is able to continue having a good life.

RUSNAK: I have a couple of questions related to your work in the Crew Systems Division, specifically on suit development and environmental controls. You mentioned that the Air Force, particularly Wright Field, was resistant to using the B.F. Goodrich suit. Had they had prior experience with David Clark, that they were entrenched with using that company?

JOHNSTON: They were entrenched with David Clark because David Clark was building the suits for them, and Goodrich was building suits for the Navy. ILC wasn't building suits for anybody. But they thought they had a lock on the suits for Mercury with their Dave Clark suits, and I told them that they had a suit that had too much back pressure for the environmental control system. They wouldn't listen to me.

But anyhow, other than that, you know, they were a pretty good group of guys. They tried to intimidate me, which I didn't like. I don't know. I told them, "Look. We're going to evaluate the suits. If y'all don't want to do it, I'll get it done someplace else."

RUSNAK: What were the advantages of the Goodrich suit over David Clark? You mentioned the back pressure.

JOHNSTON: Their vent system was compatible with the Mercury ECS. The Dave Clark suit had too much back pressure for the ECS. We were going to have to do something. I didn't know exactly what. But we ended up picking the Goodrich suit, and we only paid about \$5,500 a suit for them. You know what they pay for a suit now? I wouldn't even want to imagine. [Laughter] But anyhow, does that answer your question?

RUSNAK: Yes. Speaking of the Mercury ECS, there was some discussion, at least initially, over the amount of pressure to use inside the capsule, whether it should be shirt-sleeve environment or at a lower pressure like 3.5 or 5 psi [pounds per square inch]. Could you elaborate on that discussion and also whether to use a single gas oxygen system versus binary?

JOHNSTON: Well, we used the single gas system in Mercury and Gemini, and I guess we did in Apollo, come to think about it. I don't know what else I can tell you. After the Apollo fire, we decided we would launch with 100 percent oxygen cabin, and as it bled down, we would add oxygen to it. The Apollo fire caused a lot of rumbles, a lot of rumbles. In fact, I had some people in headquarters were trying to get me fired, but it didn't work. I don't know what else I can tell you. I think that when we went into the Shuttle—well, actually, even in Skylab we had the same oxygen that we had for Apollo, but the Shuttle's got like a 1-atmosphere. So I don't know what else I can tell you. I think that, you know, if it had to do all over, we probably wouldn't have flown the Mercury with the atmosphere we flew it with, but there was a guy in headquarters felt I was the person who made the decision to have that environment, and I really wasn't. But that was all right.

Anything else?

RUSNAK: Just one final question relating to the development of the Apollo lunar suits. In designing the lunar module, they had to make some assumptions about the actual surface itself. There were some scientists who believed that you would sink into the dust and that kind of thing. What type of assumptions were made in designing the Apollo suits for making the lunar excursions?

JOHNSTON: Well, we really, first of all, we basically made a suit that had a comfort liner, a bladder layer, and a restraint layer. Okay? And then on top of that we put a covering that was made up of alternating layers of reflective material and on outer cover of beta fabric. I don't really know what else I can tell you about the suit. The suit was a great suit. It had good mobility and people could do everything they wanted to do with it. The backpack was designed to—I guess it could go like six hours on the lunar surface with it. It had an emergency oxygen system on top of it.

We spent a lot of time developing that, and Hamilton Standard developed the backpack, and ILC, the suit. We tested it a lot over in the big vacuum chambers over—you know the great big chambers over there. I forget what building it's in. Anyhow, that's where we tested them. And we didn't have any trouble with them on the Moon. I'm not sure if we hadn't had the Apollo fire how well we'd have done with the suits, because it made us go back and reexamine a lot of stuff. In fact, we made flight suits that were made out of beta fabric.

RUSNAK: More fire-resistant?

JOHNSTON: Yes. In fact, most of the bags and things that we stored stuff in were made out of beta fabric. After the Apollo fire, I tell you, we really carefully examined everything we were doing and cut down the potential of fire in the spacecraft, and we never had any problem after that. And it's unfortunate we burned those guys to death.

Anything else?

RUSNAK: After the Apollo fire, the fire specifically, what type of damage had the suits themselves taken that led to changes?

JOHNSTON: You know, I flew down to the Cape that night, and I was there for I don't know how long, ten, twelve days. But I went out and looked at those suits, and it was one of the most horrible things I ever had to do in my life. Those guys really suffered. It was bad. I don't know what else to tell you. I think that—you know, one of the problems with the Apollo fire, they had an inward-open hatch, and the spacecraft was pressured to 16 pounds. So when the fire went off, they couldn't get the door open, and they just burned to death.

Anything else?

RUSNAK: That's all. Thank you.

BERGEN: Thank you for sharing your memories with us.

JOHNSTON: Well, I hope it was what you wanted. Do you want me to come back over and talk to you about Skylab?

BERGEN: Yes.

[End of interview]