

ORAL HISTORY TRANSCRIPT

C. FREDERICK MATTHEWS
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is June 23, 1999. This oral history with C. Frederick Matthews is being conducted in Lexington, Massachusetts, for the Johnson Space Center Oral History Project. Interviewer is Rebecca Wright, assisted by Carol Butler.

Thank you again, Mr. Matthews, for allowing us in your home to spend some time with you and gather up some of your memories on tape. We'd like to begin today by you sharing with us how you first got interested in aeronautics.

MATTHEWS: Well, it started when I was about six years old. I saw my first airplane. This was in the late 1920s, and it was a barnstorming airplane that landed just outside the city where I was born, Guelph, Ontario, Canada. That started me being intrigued.

Then the next thing that got me started was my aunt gave me my first magazine, called *Flying Aces*, and, boy, was I hooked. [Laughter] I started [building] balsa models and reading everything I could. I started a scrapbook of all the news stories I could find.

Then along came World War II and the aviation activity around Toronto, where I was living then, became very active. The Victory Aircraft was building Lancasters and a whole bunch of other airplanes. DeHavilland was building Mosquitos. The Norwegian Air Force had set up a fighter training base on Toronto's Island Airport. There was all sorts of opportunities to see aviation starting to grow.

Then I joined the Air Force and became a pilot for a couple of years. That was after I'd started aeronautical engineering. I took one year of aeronautical engineering [and quit] to join the Air Force.

Then after getting out of the Air Force at the end of the war, I went back to school, finished my education, got my aeronautical degree, and went to work for AVRO Aircraft, which had bought the old Victory Aircraft. Victory Aircraft was government-owned during World War II, and they were building the first jet transport on the continent, called the Jetliner, AVRO Jetliner. They were building a twin-engine fighter called CF-100. They were building engines for the CF-100, and they had three production lines going down. So this was a great opportunity to just come out of school and get involved with all of that.

Soon as the Jetliner was ready to come off its production line, they opened up a flight test department, and I went from a stress office to flight test, and then had a chance to fly in the Jetliner, including flying with old Howard Hughes. [Laughter] And flying in the prototypes of the CF-100. And so it went. That was sort of how I got involved in aviation.

At AVRO, the last product we built was the Arrow, the CF-105, and it was poised to be the fastest fighter in the world, but its life was cut short. I was in charge of all the flying airplanes. We had five of them flying, and the sixth was ready to go with our own engines.

The loudspeaker came on one afternoon about two o'clock and said, "So sad, too bad, goodbye. Everybody below the level of vice president is hereby laid off," and 14,000 people left that afternoon. After that is when I started to get involved with NASA.

WRIGHT: I'm sure that was quite a shock to all of those people in that plant.

MATTHEWS: By the time a month was up, there were 50,000 people out of work simply because it ricocheted down through all the subcontractors. I wrote forty-some-odd resumes to aircraft companies, to airlines, and so forth, never got one answer.

I got a call one day. I think it may have been from Jim [James A.] Chamberlin—I can't remember now—saying that NASA was going to come up and interview, because they were desperate to get engineers, because NASA had never done a project before. They were

always research. And being research, they never hired senior engineers; they just hired graduates out of school and let them grow up through the organization. As a result, their salary structure was down just a bit from the industry, so they were having a tough time getting experienced engineers.

So suddenly here was this pool of engineers available, and they knew our work because they had done rocket firings with models off Wallops Island [Virginia] for us, or with us, and they had done some wind tunnel tests and so forth, so they knew the company. They knew Jim Chamberlin in particular. So they came up and interviewed us. Bob [Robert R.] Gilruth interviewed me with Chuck [Charles W.] Mathews—no relationship, although my first name is Charles. He spells his name with one "T," mine with two. Anyway, that was the beginning of my involvement with NASA.

WRIGHT: I guess just a few weeks before, you thought maybe that life in aeronautics had come to an end, but yet now a whole new adventure lay in front of you?

MATTHEWS: Yes, yes. I'd never thought of space, although I'd taken a course in space. I was really a dyed-in-the-wool airplane man and had never thought of anything [else] in particular. In fact, I was so busy up until the roof fell in, that what was going on in the rest of the world wasn't always clear. We were working seven days a week, three shifts, and I only had enough people to cover about a shift and a half about six days. So it was a lot of overtime and on call.

WRIGHT: Were you aware of Sputnik and what was going on with the Russian space agency at that time?

MATTHEWS: Not aware of it in any sense beyond noticing it in the newspapers.

WRIGHT: What were your thoughts when you learned that?

MATTHEWS: I don't think I had much reaction whatsoever. As I say, we were so buried in trying to get this Arrow going, that I didn't have much reaction to it at all. And I don't think there was that much reaction in Canada either, in general. It was, "Oh, yes. One of those interesting things."

WRIGHT: So now Mr. Mathews and Mr. Gilruth were inviting you to come to America and be a part of this whole new program. Did they give you any idea what you'd be doing when you came to work for them?

MATTHEWS: Not really. [Laughter] All I knew was that they were starting off this ambitious program which I'd read a little bit about, Project Mercury, and that I'd probably be working for Chuck Mathews, who was going to head up the—or was heading up the Operations Division. Other than that, it was, "Well, this is the only game in town, so I guess I'd better join it." [Laughter]

And so there were about twenty-five of us went down, roughly, and this was probably when the basic Manned Space Task Group had only about twenty-five engineers, who almost all of them had come from Langley. I think one of them or two of them had come from other NASA centers, plus the seven original astronauts had just been named, so it was the original core of what's now the big Manned Spacecraft Center. It was kind of exciting. [Laughter]

WRIGHT: The goals and expectations that the Space Task Group had, as you said, was for this great new adventure and a great new program. How did you feel about all those? Did

you ever have a doubt that as part of this group you'd be able to fulfill all those goals and reach those?

MATTHEWS: I took it as a big challenge, having worked in the aircraft industry with prototypes, the Jetliner and the CF-100 and the CF-105. I said, "Here's another challenge." [Laughter] A big one, but I like doing new things like that. It certainly was a challenge.

WRIGHT: And a very new thing.

MATTHEWS: And new, yes. And learning a lot. It was learning as you go.

WRIGHT: Tell us about the transition from leaving Canada and moving down to the Langley area. Was that a smooth operation for you and your family?

MATTHEWS: That was tough on the family, because all our relatives, our friends were in the area, and here we were going off into an area we didn't know anything about. My father had said, "Oh, you're going down near Williamsburg [Virginia]. You'll love Williamsburg." And I'd heard a little bit about Williamsburg and I thought of it as being old taverns with big flashing neon signs saying "Ye Old English Tavern Here," you know. [Laughter] And, boy, was I surprised and delighted when I found out what Williamsburg was like.

But it was tough on the family. I went down by myself, first of all, went down to—I arrived in the middle of the night in downtown Newport News, and pouring rain. Boy, downtown Newport News is not the most hospitable place, even in the daytime, and, boy, was I discouraged. But I found where Jim Chamberlin and a few of the others were staying at a motel in Buckrow Beach, and I found the motel and bunked in for the day, and the next day went out to work.

When school was over, I came up, went back up to Toronto, picked up the family and the two cats in a little coupe, Studebaker Coupe, and drove down, the five of us, the five of us in this little coupe, drove all the way down. The house wasn't ready because the floors were still wet. We were going to move into an area called Stoneybrook, and there were several of the Canadians had moved into Stoneybrook—Len [Leonard E.] Packham, John [D.] Hodge, Jack [N.] Cohen, myself. The only house that was finished—this was a new development—the only house that was finished was John Hodge's, so Tec [Tecwyn] Roberts and I bunked in with him. We didn't have any furniture. I bought a lounge chair and slept on it. It's still out in the back yard. [Laughter] So we got along pretty good.

It was then that I found out that three of the astronauts had gone into Stoneybrook as well. Wally [Walter M.] Schirra [Jr.] lived across the street from us. Deke [Donald K.] Slayton lived over near Tec Roberts and John Hodge. Gus [Virgil I.] Grissom lived over next to Jack Cohen. So it was an interesting little community.

After the family came down, we settled in, and they soon became acclimatized to it. So we realized, all of us realized afterwards that the move, after it was all over and we'd spent the three years there, that the move had broadened us. We had both enjoyed it and we learned a lot, and it was very broadening in our whole life.

WRIGHT: Tell us about you and transitioning now into your new job. What was it like at Langley compared to what you had been used to before, and about the new duties you were taking on?

MATTHEWS: It was quite a bit like what I had been doing before. In other words, I used to say, when I was looking for engineers to work for me at AVRO, I used to tell personnel, "Make sure you get somebody with a pair of roller skates and a sense of humor." [Laughter] Because it was panic a lot of the time. A lot of it was well planned, but there were things that

kept you really on your toes and running. The original organization of the Space Task Group in the Operations Division was pretty loose. People were assigned ad hoc tasks and so forth, and it took a while for the organization to get sorted out and settle down in terms of who was supposed to be doing what. But it was a lot of interesting tasks.

Frank Thomas, another Canadian, and I went down to the Cape to talk to the range safety people. That was one of the first things we did. Range safety had always operated by themselves, away from the launch activity, and they were charged with if the launch vehicle didn't go down the designated corridor, that if it strayed outside that corridor, they would destruct it, hit the "destruct" button. So the question now was, now that there's a man on board, how should this activity be carried out.

We thought they should move in with the Mission Control Center. That was the Operations Division's general opinion. But they said no, that they would put a coordinator in the Mission Control Center. In the end, it turned out that was the right way to do it. That was a good way to do it. It worked out quite well.

Of course, they never had to do it, though they told us a funny one about a multi-stage vehicle being prepared for launch, and when they hit the firing button, instead of the first stage igniting, the second stage ignited, leaving the first stage on the pad. The second stage was unguided, and it went wandering off back towards the mainland over the Banana River. Of course, soon as the range safety saw this deviating out of the corridor, they didn't know they were tracking the second stage, because they were in their little cubbyhole by themselves, just looking at the radar plots. So soon as they saw it deviate, they hit the "destruct" button and blew the heck out of the first stage that was on the pad and blew the pad to pieces as well. [Laughter] They changed their rules of where they put destruct packages after that. Of course, they had no influence on what was happening to the second stage and fortunately it landed in a remote area, didn't do any damage.

WRIGHT: Those first days when you were there and you had so many people that had so many talents and everything was new. How were you all able to focus and get the operations area clicking the way it needed to be to make the successes that you were expected to do?

MATTHEWS: I think a lot of that has to do with Chuck Mathews and Chris [Christopher C.] Kraft. They organized the place. They had some good assistants. Sig [Sigurd A.] Sjoberg was one of them. They eventually got the organization to where I think they picked up the various talents and put them in the appropriate slots. I think they did a good job on saying, "He's very good at doing this. Let's put him there."

So I think, in the end, the allocation of the personnel to the organization, or vice versa, it was almost vice versa, I think, was very good. There was a lot of talent that arrived. There was a lot of talent when we got there. We brought some different kinds of talent. Then there were other hires that augmented it even further, and it kept growing and ended up a pretty efficient organization. Still a lot of ad hoc things going on, but it worked out pretty well.

WRIGHT: How did they focus you? Tell us how they took your talents and what did they ask you to do. Walk through with us.

MATTHEWS: Very early on, they came up with a—Bob Gilruth published a list of controllers—these were the top-level controllers—and I was named as the backup flight director to Chris Kraft and John Hodge. Chris had the overall direction of all the flight control organization and activities.

John Hodge was the flight director at Bermuda. Now, Bermuda was a pretty important down-range station simply because the insertion point into orbit was halfway between the Cape and Bermuda. This meant that you were leaving the communications and

radar coverage of the Cape, so maybe you might be losing signal, but you were approaching Bermuda, and they were starting to pick you up. So if the decision that the capsule was in orbit and should stay there couldn't be made at the Cape, then the decision would be left to Bermuda. John Hodge at Bermuda would be the one to make the decision.

So I was backup to both of them, but there was a missing gap in the flight controller organization, which was all the flight controllers for the down-range stations. So I inherited. I don't know whether I was assigned it or inherited it or what, but I ended up being responsible for all the down-range controllers.

Shortly after that, I had an addition to my group. I was made head of the Flight Operations Section. I'm not sure that's the right title, but they kept changing titles. The branch was called the Spacecraft Operations Branch for a while until everybody realized what the initials stood for. [Laughter] They changed that.

So anyway, I had all the flight controllers in my section, and along came a new hire, Gene [Eugene F.] Kranz, who joined the section, and he then was assigned to the Cape operation. He was added to the Cape personnel, the Mission Control Center personnel. That kind of relieved me of having to be prepared to take over from Chris.

So I ended up concentrating primarily on the down-range stations and all the flight controllers for there, and we had hoped to get the personnel for the down-range controllers, other than the medical people, from the other divisions, from Ops Division and other divisions, Space Task Group, but it soon became apparent there weren't enough. So I got a hold of personnel and purchasing, and got them to put out bids for contract personnel willing to travel. That was on a Friday, I think it was, a Thursday or a Friday, and to my surprise, on Monday, on my doorstep were nineteen people from Philco-Ford Service Company, who were used to traveling around the world. I had hoped to get more engineers than they were, but they were technicians, and they turned out to be superb controllers and didn't faze them a bit about traveling around the world. So that was a big addition to the operation.

WRIGHT: What were the responsibilities of these down-range controllers?

MATTHEWS: Well, the down-range control team consisted of a capsule communicator who talked to the astronaut. He was responsible for determining the status of the overall mission at that point. The second one in the team was an engineer who was responsible for the status of the capsule. He [monitored] all the telemetry information regarding the environmental system and fuel systems and so forth. The third one was a doctor responsible for the status of the astronaut medical status. So here it was. They were responsible for how goes the mission, how goes the capsule, how goes the astronaut. That was the team.

The non-medical flight controllers were pretty junior, and some of them had a little more experience. The Philco-Ford ones had a little more experience, but a lot of them were quite junior engineers. [But] medical people who had been recruited by Stan [Stanley C.] White, Dr. Stan White, Colonel Stan White, were senior. They were nothing less than a major. When I gave a briefing to the medical people about the team, the remote teams, there was one Navy captain who said, "You mean I'm junior? I'm subordinate to those juniors," to the capsule communicator, who is the senior one. I said, "Well, it's the same as an airplane pilot. Whoever is the pilot is in charge of the airplane, independent of his rank." That was the only time anybody tried to pull rank.

WRIGHT: Well, that's good news.

MATTHEWS: Yes.

WRIGHT: How many teams did you have?

MATTHEWS: Well, there were—I guess it was sixteen stations altogether, including the...[Mission Control Center and Bermuda], so that's fourteen. I think that's the right number. I'd have to go back and check.

The Canary Islands; Kano, Nigeria; Zanzibar; Indian Ocean ship; Muchea in Australia; Woomera in Australia; Canton Island; Hawaii, on Kauai; Point Arguello in California; Guaymas, Mexico; and Corpus Christi, Texas. I think that's all.

WRIGHT: Was there one of those that was harder to staff than the rest of them?

MATTHEWS: What we did was, rather than stick somebody with a tour of duty on the Indian Ocean ship, which was an old World War II freighter converted, and it would take two weeks to get on station, two weeks on station, two weeks to get off station, and rather than stick the same controllers, what we did was we rotated them, you know. It was kind of tough to say, "You're going to the Indian Ocean ship, and you're going to Hawaii." [Laughter]

WRIGHT: You'd have a fall-out on rotation, did you, every time it came time to go to the Indian Ocean?

MATTHEWS: No, no. Some of the medical doctors were flight surgeons in the Navy. They were a barrel of monkeys. They were hilarious. They were good doctors, but they had a real sense of humor. One of them was assigned on this one trip to be on the Indian Ocean ship. Of course, they were out there for about six weeks, almost six weeks. During that time, one of the crew members—the Indian Ocean ship didn't have a medical doctor on board, so whoever was the medical person assigned took his little black bag with him and acted as the medical guy if necessary.

One of the crew members took appendicitis, so he operated on him on the mess table. He was written up in the *New York Times*. And when he got back, the other flight surgeons started to tease [him] mercilessly, saying, "He didn't really have appendicitis. All he had was a pain in his stomach. You just did the operation because you were bored silly and wanted something to do." [Laughter] But there was a lot of camaraderie among the flight controllers.

WRIGHT: That's good. Were you in constant contact with all of these teams that you placed out during these six-week time periods, or was that somebody else's responsibility?

MATTHEWS: No, they did all their contacts through the Mission Control Center. However, in my office I had the only teletype drop off the Worldwide Network that wasn't on one of the sites, so I could monitor some of the stuff that was going on. And if there was any problems anywhere, they'd call back if they had a phone. Some of them didn't. Now they have satellites, are the communications, and that's done away with the need for all these down-range stations as well.

WRIGHT: While those folks were out doing their jobs, you were doing additional duties.

MATTHEWS: Yes. There was always the business of doing simulated missions for about a week or so, up to two weeks sometimes, before the missions. So I was sometimes down at the Cape and wandering around various places. Went out to Bermuda once as they were building up the station and almost ready for the first orbital mission, which was an unmanned mission, and John Hodge was there. He was the flight director. I went out just to check on the status of the station, to see how they were making out.

The government-to-government agreements in Bermuda were that the station was completely unclassified, but the command codes to the capsule, like retrofire, reset the retrofire clock, those kinds of commands were classified confidential. I don't think they were secret; I think they were confidential. So the question then was, I wanted to check to see if they had the right command codes set in the transmitters, and so how do I get this classified code into Bermuda? So I buried it in an unclassified document and took it with me. It's a good thing I did, because they had the wrong codes in. [Laughter]

John Hodge was really irate at the subcontractor who was doing the software for the system, because they were doing changes, and instead of keeping a copy of the original before they did the change, they just went and stuck the change in. This made it difficult sometimes, if not impossible, to go back to the original if there was a problem with a change. So he finally got them to start keeping copies of the originals on their software.

One of the other ad hoc tasks—[I] kept coming up with ad hoc tasks—was, I was given about two days' warning to go up to Wallops Island, no time for preparation or anything, just go. They had scheduled a Little Joe test. The Little Joe is multiple solid rockets, unguided, just pointed. It was to test the escape tower, to make sure that the escape rocket was strong enough to pull the tower off the launch vehicle at the maximum dynamic pressure. So they'd had several failures, and now if they had another failure, it would affect the launch schedule. So they sent me up there to make sure it went right. [Laughter] I've got two days to figure out what went wrong with the past and see if there was anything I could do.

I went up and reviewed the project status with the project director, and I decided there was nothing I could do in two days, so I just let it go. I could watch it as the launch took off, and I could watch it out the window of the launch blockhouse, and to our horror, one of the rockets on the bottom didn't light. This meant instead of the vehicle traveling in a straight line, it started to arc down towards the ocean. If it continued that way, it would have gone

right into the ocean. All of a sudden, the missing rocket lit from the heat from all the other rockets around, and it took off in a straight line, but now it was much lower altitude. [Laughter] Because it had been sagging down. The escape rocket pulled it off properly, which was lucky, in a sense, in that the test had taken place at much greater dynamic pressure than what the test was designed for, what the system was designed for. So it passed its over-pressure test, so that was a relief.

WRIGHT: I guess a relief, too, that it was definitely a test and not a manned vehicle.

MATTHEWS: Oh, yes. Well, they were pretty good at doing these tests to make sure that things were going well, and that was one of the reasons for putting a monkey. They'd have an unmanned shot and a monkey shot, a chimpanzee shot, and then a manned shot, was sort of the general philosophy.

In the early days, one of the tasks I was given was to go down with the astronauts' doctor, Bill [William S.] Augerson, to monitor the Redstone flight of Able and Baker, the little monkeys. This was launched by the Army. This was before [Wernher] von Braun had transferred to NASA. So we went down. As we said, we went down to kiss the monkeys goodbye. We went and took a look at the operations. We were invited into the blockhouse and saw the operation, how they did their launch control and so forth. Bill was interested in how the doctors were monitoring the monkey and so forth.

So later on, a few months later, it looked as though the spacecraft was going to be ready before the Mission Control Center was ready for the ones before Shepard, and so the question then was should they have a makeshift interim Mission Control Center. Since I'd been down looking at the launch blockhouse for the Redstone—and, of course, [Alan B.] Shepard's [Jr.] was on a Redstone—the first thing that came to mind was maybe we can squeeze into the launch blockhouse and put some telemetry displays and so forth there. But

that didn't turn out. That was too tight a thing. It would compromise the launch operation as well as anything we wanted to do.

So then the idea was to look for an alternative. When I was at AVRO, we had a telemetry trailer that was mobile. We could take it around various places, and it fed a real-time aircraft flight monitoring, sort of a mini Mission Control Center for the aircraft flight test. I thought, hey, they had all this equipment stuffed in the telemetry trailer. Maybe a big forty-foot trailer might do it. We could put the consoles in there and have enough room for people to stand in front of them.

So on the back of an envelope, almost—well, it was really 11-by-18 sheets of paper—Arnie [Arnold] Aldrich and I—Arnie later became head of the Shuttle Program, and he had just come straight out of school to join me in the controller section. So we went out to McDonnell and asked them to see if they could build this big forty-foot Mission Control trailer, interim Mission Control trailer. There was no time to go out for bids. Even then, there was no time to give formal information to the basic designers in McDonnell, so I got the bright idea, based on our AVRO activities, to go to their flight test people and get them to build it as though it was for themselves, you know. "Hey, here's the money and here's the concept. Go do it." And they did. They took to it. They delivered it, and NASA checkout people at the Cape said it was the best trailer they had seen.

MATTHEWS: But it never was used at the Cape for that purpose, because the capsule schedule slipped, and so the Mission Control Center schedule caught up with the capsule, so they didn't need it. But they did use it for monitoring the astronauts and things, and Johnsville [Pennsylvania] centrifuge programs and things like that. So it did get used, but not for what it was originally intended.

WRIGHT: When you were working so closely with the flight controllers, we understand you were very instrumental in creating some of the procedures that they used. Could you give us some background on how the books and the procedures and all the rules came around and benefitted those flight controllers?

MATTHEWS: Yes. It dawned on me one day that the astronauts had their procedures books. There's one of them right there. And the technicians at the Cape had all their procedures for checking the system out and so forth, but the flight controllers had no written instructions whatsoever. So there were two things missing. One was the procedures or information regarding the spacecraft and the mission, and the second one [was] mission rules.

I guess the first one was my idea, was the Flight Controller Handbook, as it was called, and the second was really, I guess, Chris Kraft's and maybe Chuck Matthews' idea, was to have Mission Rules. So those two documents ended up in my lap, so we published a handbook that told for each individual system on the spacecraft, what could the astronaut see and what could he do and what can you see on the telemetry that's coming down to you as a flight controller.

Then we did this for each and every mode that the spacecraft could be put in. We found things in doing this that the astronauts—the designers didn't even know, by having done this every mode business. For instance, we showed the astronauts that if they weren't very careful, they could use up a lot of their attitude control fuels by trying to use the automatic system and the manual system at the same time. They'd end up fighting each other, just wasting fuel. So that was one thing.

The other thing we found out was, I got interested in the fact that there were two buttons, switches, on the astronauts' control panel. One was for firing the retro rockets to come home. The other one was to jettison the retro rocket package after it had been fired. They were sitting one above the other, four letters, JETT RETRO, FIRE RETRO, and if

there's an emergency such that there was smoke in the cockpit or the astronaut, his suit had pressurized because of a leak, he might have meant to hit "FIRE," and by mistake hit "jettison"—JETT, J-E-T-T. Then he'd be up there forever; he'd never come home. They said, "Oh, that's no problem." Everyone said, the astronauts said, the designers said, "That's no problem. It's all interlocked. They can't jettison the retro pack until it's been fired." And the more we looked into it, the more we said, "Nuh-uh. If you hit that 'jettison,' you're there forever."

So I told Wally Schirra this, and he took it up to the next design meeting they had with McDonnell, and sure enough it proved that there was no interlock. So they put a guard over the "jettison" switch. So those kinds of things were little extra things that came out of it.

WRIGHT: Very important, though.

MATTHEWS: The Mission Rules were the other document which Chris gave me some guidelines about what he wanted, and so I generated the first draft. These rules defined the status that the spacecraft and the astronaut had to be in, in order to launch, to be inserted into orbit, or to abort at any time, come home early either immediately or at, say, the end of an orbit. And so these became very useful, because it meant that everybody, the astronauts, the flight controllers, all knew what the rules of the game were ahead of time. So those two documents became mine.

Later, after Gene Kranz had come aboard, he took over updating the mission rules, and most of the updates were his. Then I wrote the first set of mission rules for Gemini in conjunction with Bill [Howard W.] Tindall, and so those were two sets of documents that were key to the flight controller operation.

WRIGHT: At least with the Gemini you had already completed the Mercury, so you had that experience behind you, but when you first did those for the Mercury, was it a time-consuming process?

MATTHEWS: I went around and beat on a lot of doors for ideas and what they thought was important. I spent a lot of time talking to the doctors. Right from the very beginning, I spent a lot of time with the doctors. In fact, one of the things that involved the doctors was Colonel Stan White had recruited some sixty or more doctors to join the team of doctors to be part of the Mission Control Center or around the world, but the question then became how do you indoctrinate these people. They're from all over the place. You have to bring them together and start training them in terms of Mission Control procedures and so forth, and what the mission's all about, what the capsule is all about, and so forth. And like the environmental system; they had to understand the environmental systems and so forth.

So Dr. Bill [William K.] Douglas was the astronauts' doctor that was assigned to prepare a briefing for all these people when they came to a big meeting that was supposed to bring them all together. But Bill disappeared with the astronauts up to Johnsville or someplace like this, and about a week before that the briefing was to take place, I found out that Bill wouldn't be back until a day or so before the meeting, the briefing. So I gathered my guys together and said, "Hey, we've got to get this prepared."

And so we came up with an agenda, with a bunch of viewgraphs, and got a whole bunch of people from the various divisions to be presenters, and had it all organized so when he came back he found an agenda and a briefing package and was all set to go. So it came off pretty well. That was when this Navy captain questioned the role of a medical doctor versus capsule communicator. About three or four weeks later, on my desk was a beautiful corncob pipe with a little note on it that said, "Thanks. Bill." [Laughter]

WRIGHT: How much prior to Alan Shepard's launch did the procedures and the flight controllers' rules and mission rules were all in place? Was this quite a bit ahead of time?

MATTHEWS: [Laughter] I don't know. I think at this stage of the game, time lines are somewhat blurred, partially because everybody was running around in circles, being very effective in running around in circles, but it was not a calm, simple, go-by-the-schedule-type thing. Everybody was doing their bit, and things evolved. Afterwards, it's tough to put a time line on things that slowly evolved.

WRIGHT: I guess that was one of those talents that you mentioned earlier, the fact that people can just continually run to accomplish much while you're still finding more to do, and nobody's egos or personalities, I guess, get in the way. You're all able to work together.

MATTHEWS: I don't know of any egos that got in the way anywhere. There were a few people that may have been originally misplaced in the organization, but they eventually found their proper home. It was very complementary, the talents. The astronauts brought certain things, the controllers brought certain things, the guys from Philco-Ford brought certain talents. Gene Kranz came in out of the Air Force, and he brought a lot of good talent to the team. He eventually took my place when I left.

WRIGHT: Did you find yourself traveling all the time, as well as doing so much there?

MATTHEWS: I could have been away 100 percent of the time, going to the different range stations and so forth, down to the Cape and out to Bermuda and things like this, and I decided that this was not a very efficient use of my time. People like Chris Kraft were away about 50 percent of the time. As his wife said at a party once, she said to my wife and a couple of us,

"Wonder what his second wife's going to look like." [Laughter] Of course they got along well, but she was teasing. There was a lot of travel, and the divorce rate was quite high. In fact, someone said it was the highest in NASA.

Anyway, I decided not to do as much traveling as I could, for two reasons. One, I didn't think it would be effective. And, two is, these flight controllers, I could go hold their hand on one station and then on another mission go hold somebody else's hand on another station, but that wouldn't have much overall impact. So I decided that it wasn't particularly effective.

WRIGHT: I'm sure they appreciated your vote of confidence that they knew what they were doing and you had other things to take care of.

MATTHEWS: Yes. They became very good at it. In fact, a couple of incidents where they did well on their jobs, I guess it was the same mission, it was the monkey shot, chimpanzee shot, before John [H.] Glenn's [Jr.] flight, where they had to bring it home at the end of the second orbit. The flight of the chimpanzee in the capsule was more stringent than with a man there, simply because the man had two attitude control systems, an automatic one and a manual one. If one failed, he could use the other. The poor chimp, he was completely dependent on the automatic, and if it failed, he was in trouble.

The controllers in Australia were the first ones to pick up the fact that there was a leak. This was the chimpanzee flight. There was a leak in the automatic attitude control system, and so they were monitoring it all the way along until Chris finally decided that it should be brought in at the end of the second orbit. The fire retro rockets for the entry at this second orbit would be just about above Guaymas, but it's much easier to set the clock ahead of time to fire the retros than it is to direct—you could directly fire them as well, but the first choice is to set the clock or, in this case, reset the clock. So he called Point Arguello to have

them reset the clock when it came over. No answer. So he called [Guayamas] to have them fire the retro rockets directly when it was overhead. No answer. And kept trying, kept trying, kept trying.

Finally he got through. The capsule communicator there was Arnie Aldrich. He got through just in time to tell Arnie, "Fire retros, four, three, two, one, fire!" And they fired and brought him in. So he came back in. But those were two instances of the flight control team doing a good job.

WRIGHT: During this time, did you still have time to visit with your friends from AVRO, or did you all go to your own many tasks and rarely saw each other?

MATTHEWS: Living in Stoneybrook, which was the area some of us lived in, and three of the astronauts lived in, it was a community that had limited—it had only one entrance and then it spread out in a big area. It had a clubhouse, tennis courts, and swimming pool, so periodically there would be parties there, and people would get together and so forth. But other than that, there wasn't much social contact. Everyone was just too busy.

The Philco-Ford wives had a bridge club, and after this trip to Australia, there were two of the Philco-Ford people assigned to it, one on Muchea and the other one at Woomera. At the next wives' meeting, one of the wives was oohing and aahing over all the wonderful woolen goods her husband had brought back, wool scarves and sweaters and mittens and things like this, and all the other girls were in envy. So they turned to the wife of the other guy that was in Australia and said, "And what did your husband bring you back?" "A boomerang." [Laughter] He probably got it around his neck that night.

Australia was an interesting place to get to, because in those days—and Canton Island was, as well, because in those days it was propeller aircraft, and Qantas was about the only airline flying down that way. They often had a stopover somewhere, and on this one

occasion, I guess it was the same mission, two of the astronauts went along, one to each station, to act as capsule communicator. They were really thrilled. I think Wally Schirra and—I'm not sure who the other one was—they were really thrilled because they were going to stop off in Tahiti. [Laughter] And they got disappointed, because the launch was rescheduled and the stopoff point was some forlorn little atoll somewhere like Guam. The astronauts got along pretty good with the flight controllers.

WRIGHT: Good. That made it easier for everybody to have confidence in each other.

MATTHEWS: Yes. A lot of the guys had a lot of good sense of humor, so it helped a lot.

WRIGHT: I imagine with all the long hours and the long days, it's maybe one of the most important qualities that a person have, is to be able to laugh off some of these—

MATTHEWS: Yes, because when you're on the station, particularly during the simulations, when you know it's not real, if you're on Kuai, shall we say, you're up there in the middle of the night, on the top of a mountain, and so you have to stay there while the simulations go. So some of the guys just bunked out behind the telemetry consoles and so forth and stayed there. They had to go up to the top of the mountain in the middle of the night. No lights except their headlights, none whatsoever, and those roads go through the jungle and down, drop off down into the valleys below. They said it was the scariest ride they'd ever had.

WRIGHT: I guess so. Did you have a lot of turnover rate? Did people want to give these jobs up?

MATTHEWS: No. No. I don't remember any turnover rate. I don't remember anybody leaving, except one chap was a good engineer, but he was not suited to be a controller, for various reasons. So I advised him to apply for a transfer to one of the other centers. He was more interested in research and things like this. He was not a real-time person. He was a good engineer, but he was one of the few that ended up in the wrong slot.

We had another incident of sending flight controllers out to the remote sites. This one chap—and I'm not going to name him—but he was all excited. He'd never been out of the United States before. We were going to send him to the Canary Islands. So we sent him out ahead of time so that he could do these—there are simulations on site as well as worldwide simulations, hooking up to the Mission Control Center. The basis for doing these simulations were audiotapes and telemetry tapes and radar tapes. So you could play an exercise into the system that they could respond to and practice. Of course, the secret of this was the tapes. So I said to this flight controller as he was getting ready to leave for the Canary Islands, "Don't forget to take the tapes."

He'd been gone about five minutes or maybe a bit more, when I looked at his desk and there were the tapes. So I called the airlines and said, "Hey, there's a government package that has to go with one of your passengers. Will you hold the flight while we get it there?" and they said, "We'll hold it for ten minutes. No more."

So I grabbed the tapes, jumped in the car, went tearing out to the airport, Patrick Henry Airport, and this was in the days of propeller airplanes before they had jetways where you parked the airplane out on the tarmac and with steps leading up to them. So there was the airplane sitting up there on the tarmac with two starboard engines, propellers going, two port engines stopped, the stairs there, the stewardess at the top, and this flight controller at the top, waiting. [Laughter] I ran out and handed him the tapes and walked back.

They were starting to pull the steps away, and the stewardess was starting to close the door, when all of a sudden out across the tarmac came the flight controller's girlfriend,

hollering out, "The keys! The keys! You forgot the keys!" He had just bought himself a brand-new red Pontiac convertible and he was going to leave it with her, and he had forgotten to give her the keys. So next thing you see is the door open fully, and Bob—well, the flight controller standing there, and he heaves the keys down to her. And she goes away, comes back beside me, and we see the airplane, pull the stairs away, start the engines, taxi out, take off and disappear. She's standing there looking at the keys, saying, "And he gave me his suitcase keys, too." [Laughter]

WRIGHT: Oh, no. [Laughter]

MATTHEWS: I understand they got married a couple of years later. [Laughter]

WRIGHT: My goodness. What a way to start a new adventure for him.

MATTHEWS: Yes.

WRIGHT: I guess he survived the mission as well and did okay once he got there.

MATTHEWS: I think so.

WRIGHT: That's good.

MATTHEWS: I never did find out how he got his suitcase open.

WRIGHT: I guess he didn't want to tell you everything. [Laughter] Well, I'm sure it was never a dull moment for you with everything going on.

MATTHEWS: Yes.

WRIGHT: Tell us about the actual work that you did while the missions were up and away.

MATTHEWS: Most of the time I was probably getting ready for the next one, trying to figure out—well, working on mission rules and so forth. Then I got a little involved with Apollo, but not much. Chris came to me one day and asked me to prepare a paper for the first briefing of industry on the Apollo Program, and what he wanted me to do was describe what the Mercury Mission Control organization and philosophies were, and how we were planning to do it, because in his mind things wouldn't change much in the future. A lot of details would change, but the philosophy would be the same. He wanted to make sure that industry understood the philosophy behind it.

So he gave me some ideas for the paper, and I wrote the paper in detail, then gave the presentation, because there was a mission going on at the time. It was unclassified, but the publication was in two volumes, one unclassified and one classified. Unfortunately, my unclassified paper got included in the classified volume, and somebody swiped that volume from me years later, after it had been unclassified. So I don't have a copy of it. I've reconstructed it from drafts I had. I always wished I had a copy of the original.

WRIGHT: I guess so, yes.

MATTHEWS: That briefing of industry was in Washington.

WRIGHT: Were you able to share in that paper what you felt were the differences between, say, how the manned and the unmanned missions were done and how that would affect the future?

MATTHEWS: We ran the unmanned missions just as though they were manned. There was a medical doctor there, and he didn't have much to do, but he was there to learn how the whole procedures went and so forth.

[The unmanned mission—] the orbital mission was just as tough as the chimpanzee. It only had the automatic attitude control system. The attitude control system was important for reentry because to fire retros, you had to hold a specific attitude, and while they were firing, you had to hold that [altitude]—so if you didn't have an attitude control system, you might even tumble. You might even go off into a higher orbit.

So the unmanned mission, orbital mission, was just as tough as the chimpanzee mission was, because they both depended only on the automatic attitude control system, but the difference was, if you left a spacecraft up there, that wasn't as bad as leaving the monkey up there, or leaving the chimpanzee up there.

We tried to use the unmanned missions as a training program, as a training step. It was not only a check of the spacecraft and the booster and so forth; it was an opportunity to train everybody, including, particularly important for the ones before John Glenn's flight, was to give the communications and radar operators on the various stations the opportunity to see a spacecraft for the first time, because at most the pass across a station was not much more than five minutes, so you didn't have much time, as a technician, you didn't have much time to find your target, get it locked on, and so forth. You didn't have much time. You'd better be good at it. So this training was very important before John Glenn's mission.

Associated with that was a move by headquarters to change the contractors on the remote stations. They wanted us to do two things. They wanted to put it open for bids so

that they could have competition, maybe save a few dollars, and also to satisfy political pressure to get competition. So they let out bids and they proposed to have the contract changed just before John Glenn's flight. The Space Task Group were up in arms because here we had trained, gone to all this trouble of training everybody on these remote stations. These were not the flight controllers now; those were NASA personnel. But these communications operators and power and site managers and radar operators and so forth were all contract personnel.

So here we were going to lose all of this experience, so Tec Roberts and I were given the chore, suddenly given the chore of going up to headquarters and to see if we could find some way of stopping this. And we did. We looked at all the proposals that had been submitted, and we found that every one of them had a definitive plan for training all the new operators, but none of them had a plan for how they were going to train the instructors. It became very obvious that that chore would end up as a NASA task, and we didn't have the time or the personnel to do this, so we wrote a very short memo, and the next day the solicitation was canceled, much to the chagrin of all these contractors who had spent a lot of money and time putting in their bids. So we killed it.

WRIGHT: I'm sure that was a benefit to you and your time schedule.

MATTHEWS: Yes.

WRIGHT: You didn't have to train all of that.

MATTHEWS: Yes.

WRIGHT: We're going to break for just a few minutes so that we can change the tape, and we'll go from there.

MATTHEWS: So how are we doing? [Tape recorder turned off.]

[Begin Tape 2, Side 1]

WRIGHT: As you were planning and working toward all of the goals that you had, as you mentioned, you didn't treat the unmanned launches any different than you would if they were manned. Then the time came when it became a manned flight. Would you share with us the preparations for Alan Shepard's flight and what you were doing at the time?

MATTHEWS: I'm not sure I can remember what I was doing for Alan Shepard's flight. That's almost a blank period in my memory. I don't know whether—all I can remember is being around a number of the simulations, or being part of a number of the simulations that took place down at the Cape.

I guess the biggest thing I remember about getting ready for it was [G.] Merritt Preston was part of the Operations Division at the time. He went on down to head up the spacecraft preparation team. He and I went out to Redstone Arsenal [Huntsville, Alabama] to brief, we thought, our counterparts on what our plans were for monitoring the Redstone missions, including Shepard's. And much to our surprise, when we got there, it wasn't just our counterparts, but they had a whole roomful of senior personnel that they wanted us to brief. And we hadn't come prepared for briefing; we came with a bunch of drawings that we were going to spread out on the table and explain.

Merritt was more fortunate than I was, because he had a number of slides in his briefcase that he was going to use later on for some other purpose, and so he gave a

presentation. Then it came my turn and, of course, I didn't have any material suitable for a large audience. Didn't have any slides or anything. So I gave a chalk talk, got up to the blackboard and started drawing and talking. I had my back to the audience while I was drawing a particular diagram, and the back door of the auditorium opened. I heard a shuffling of feet, and everybody stood at attention, and in walked von Braun. He signaled everybody to sit down and told me to continue, and afterwards he came up to me and told me that he enjoyed the presentation, it was very good. That was the second time I'd seen von Braun.

The first time I had seen him, I guess it was after the Able-Baker flight. In those days, all their recordings off the telemetry system were analog, not digital, and so after a mission they would play their telemetry recordings back on long strip charts. Here was von Braun in the middle of Hangar S, which was their hangar at the time, with a strip chart that ran from one end of the hangar to the other, and there he is on his hands and knees, with a little pocket ruler, measuring the excursions of various signals along the line. That was my first encounter with him. The second was at the briefing.

So that was probably the biggest preparation that I can recall. There were a lot of other things probably going on.

WRIGHT: Then, of course, following Alan Shepard, one of your neighbors, Gus Grissom, went. Then you had a good mark, I guess, to see how well your procedures and all of your—

MATTHEWS: Yes. The Redstone flights were all focused, of course, so far as flight control was concerned, on the Mission Control Center, because they were just up and down. But on Gus' flight, the biggest thing, of course, was the fact that they had added explosive bolts to the escape hatch, escape door, and those explosive bolts, where the switch for it was three positions, one was "off," the second was "arm," and then "fire." And the idea was, on the

previous capsules, it just took too long to get the door open. So the idea was the capsule would be in the water, the helicopter would come in, grapple, and fire the door, and get out, and they'd pick them up. But he armed, apparently armed the door before they grappled the spacecraft.

As a result, it's thought, but nobody knows for sure, it's thought that there was an extraneous static electricity current that fired the door. He didn't fire it. He'd armed it; he hadn't fired it. And, boom, the door went out, as Gus said afterwards, "The door blew out into the water, followed immediately by me." [Laughter] Because the water was starting to come in. And because he was struggling in the water and under this helicopter that was trying to pick the capsule up, he was in the water for quite some time, because this helicopter wasn't successful in pulling it up. It kept trying, trying, trying, trying, and he was underneath the thing. His suit was slowly filling up with water, because there was an open connector on his suit.

He was only saved from drowning by the fact that the helicopter got a red warning light on its engine, an over-temperature [light], because of all the effort that [it] had been putting to try to drag the capsule out. So it cut the capsule loose and went away back to the carrier, and another chopper came in and picked him up, just in time.

Another thing, talking about the Redstone flights, was the chimpanzee flight before Shepard, the little chimp was in a suit and he had little buttons or switches to play with in response to certain lights, and if he did it the right response to the lights, pattern of lights, then he'd get a little reward of a banana-flavored pill. If he didn't, he'd get a little electrical shock on his butt.

So he was doing a perfect job all the way through the launch, all the way up, until he got up to the top of the arc, of the trajectory. When he got to the top, a big flash of sunlight came in through the window. We could tell what was happening afterwards. We could tell what was happening because we had a time-lapse camera in there. Every second it was

taking a picture of what was going on. That's how we could tell he was doing a perfect job, up until that moment.

The flash of sunlight caught his attention. He looked out, looked down, saw the ocean down below and all the islands and so forth, and was fascinated. Because he was fascinated, he didn't keep up with his tasks, and therefore he got a little jolt in the butt to remind him to get back to work. So he didn't miss a beat all the rest of the flight.

Now, there was a message there. Everybody laughed when they saw the time photography that was shown at a debriefing. Everybody laughed and they said, "This is really funny to see the look on his face when he came back to do his thing." They didn't get the message. The chimp was trying to tell them something. On Shepard's flight, the people in charge of planning the mission had given him sort of a set of tasks that he was supposed to do. He got up to the top of the trajectory, he looked out the window, he saw the islands and the ocean and so forth, and he became fascinated, and he got way behind on his tasks. Of course, he didn't get a jolt. [Laughter] So the monkey was trying to tell them something and nobody recognized the message, which was, give the astronauts some time to look around. So that was one of the things the monkey taught us, or tried to teach us.

WRIGHT: The debriefings were a very useful time for everybody. Who was there at the debriefings after the launches?

MATTHEWS: All the operations people from the Mission Control Center for the unmanned, and for the orbital missions they delayed the briefing until they all got back from their assigned stations. Then there were other people who were designer project people and so forth, other people would show up. There was really two sets of debriefings. One debriefing was over the communication links immediately after the flight, and the center of the debriefing was the Mission Control Center, who controlled the debriefings and had each

station report in as to what their experiences had been. But then there was this second debriefing later.

On one of the missions, it was probably the chimp before Glenn's flight around the world, orbital mission, we sent a team to Kano, Nigeria, and it included a colonel in the Air Force. I'm pretty sure it was a colonel in the Air Force. And he was black, a doctor, full doctor. Kano newspeople and politicians and so on played this up really big. They thought this was fantastic that NASA would send a black medical doctor on this important team to their country.

I had to make arrangements for all the flight controllers when they came back, because some of them, particularly the medical people, weren't from that area; they were from other places. So I had to make arrangements to put them up in hotels and things like that. He went to sign in at the biggest hotel, where I had made his reservations, the biggest hotel in Newport News, and they wouldn't let him in. I wasn't prepared for this overt—I wasn't used to this overt racism. And that was only one incidence of it. In the Canadian Air Force, when I was training as a pilot, my bunkmate was black, black as could be. You couldn't be any blacker than he was. He was from Jamaica. But I never thought anything about it, and so it was a big surprise to me. I finally had to get the doctor, the colonel, some housing in the Air Force Bachelor Officer Quarters. But that was the only untoward incident that I can remember.

WRIGHT: That's, I guess, the good part of that story, if that's the only one. You were moving, again, closer toward John Glenn's flight, where it wasn't just going to go up and come back; you were actually going to send a man around the world. Were your flight controllers prepared to do that?

MATTHEWS: We hoped so. One of the things we did was we rigged up a dummy world of remote stations in one of the big buildings nearby, NASA buildings that held a wind tunnel, one of their wind tunnels. With big wind tunnels, there's lots of space underneath the tunnel itself, usually, so we used that space to set up some remote stations with consoles, dummy consoles, and communications, and had them all hooked together and ran simulations with the Worldwide Network that way.

Then the other aspect, of course, as I mentioned earlier, was using the missions to train—the unmanned mission and the chimp missions—to train everybody, including the station operators...as to what was coming and as to how they would react.

WRIGHT: That mission was very significant to the space program, and from what we've read about you, also to you, because we understand right after the mission you opted to leave NASA.

MATTHEWS: Yes. I left for personal reasons, nothing to do with NASA. I left almost immediately after John Glenn's flight and came up to Massachusetts to work for my old boss at AVRO, who had come to work for RCA.

WRIGHT: Had you made that decision prior to that mission?

MATTHEWS: Oh, yes, yes.

WRIGHT: What led you to make the decision to leave NASA at the beginning of this?

MATTHEWS: Really, two parts to it. One had to do with both our parents were in Toronto and not in very good health. We didn't really want to move much further away than we were at Langley. That was one.

The other aspect had to do with schools. We'd already made change in the schools to come down to—and that was a big change for the kids. If we had gone to Houston, the Manned Spacecraft Center wasn't ready, hadn't even started, and so they started their operation there from various rented, leased locations spread around town, which would have meant living in Houston and then later on moving up to the center area. That would mean two school moves, and I thought, "Enough. One more is bad enough, but two is out of the question." So I was saying I didn't want to see my sixteen-year-old, oldest boy, say goodbye to his girlfriend again. [Laughter]

WRIGHT: What a nice dad. [Laughter]

MATTHEWS: And a strange thing, small world. Three years ago I did some work for ARINC, Aeronautical Radio, Incorporated, down in Annapolis, Maryland. We were doing a big proposal for a Korean airport. I got to talking to the office manager, who turned out to be from Newport News. So I said, "Oh, I used to live in Newport News, out in Stoneybrook." And he said, "Oh, when I lived there, I knew a girl that lived there. Connie Ogle." Was my oldest boy's girlfriend. Now, is that a small world or is that a small world?

WRIGHT: Did you have some of your former AVRO colleagues as well as your new co-workers at NASA encourage you to come to Houston? Were they hoping you would come with them when they moved, to keep the team together?

MATTHEWS: Jim Chamberlin offered me a—I was a GS-15, I guess, at the time. He offered me a 16 to come work for him in his project office. He was working on Gemini at the time. It's not known as Gemini, really; it's "Jim and I." Because he was the instigator. He was the guy that defined the configuration of Gemini. So we used to joke and say it's not Gemini; it's "Jim and I."

So he offered me a 16 to stay. I also got an offer, an unofficial offer, or preliminary offer, from headquarters to go up there. At the time I was a little leery of Washington. To me, Washington was an unknown, whereas I knew my old boss up here in Massachusetts, and had worked with him and for him for a number of years. That was more comfortable.

WRIGHT: Sure. Now, before you left, did you feel the contributions you made would continue on and make quite a difference in the missions that were going to follow, to have a chance to test out those mission rules and those Flight Controller Handbooks?

MATTHEWS: I'll let somebody else answer that question, what my contribution was.

WRIGHT: Let's answer the part, if you would, about the mission rules and the flight controller books.

MATTHEWS: There will always be mission rules.

WRIGHT: And serve their purpose well?

MATTHEWS: There would always be mission rules, and they would always evolve. Each mission would be a little bit different. For the remote controllers, there was always this panic of trying to get copies of the latest mission rules and the latest Flight Controller's Handbook

ready, up to date at the point they were going to leave on an airplane. So that was finally solved. We finally got our own duplicating system.

WRIGHT: I bet that came in handy.

MATTHEWS: Yes.

WRIGHT: Because we have to remember these were days before computers, where you could make one word change.

MATTHEWS: That's right. Yes. Fortunately, I had three secretaries to help out. I guess I had more secretaries than anybody else. But there were three secretaries there. One was familiar with the Worldwide Network and put messages on it and so forth, and the other two were general typists.

WRIGHT: And very busy typists, I'm sure.

MATTHEWS: Yes. But there were panics. People would come running in, "How am I going to get this duplicated?" [Laughter] This was before we got our own system.

WRIGHT: You left NASA and came to Massachusetts and joined RCA.

MATTHEWS: Yes.

WRIGHT: Tell us how you went through that transition.

MATTHEWS: One thing more before we quite get to that. I left and came to RCA, and subsequently there was a report, a document, put out on the results of John Glenn's flight, the first manned orbital, U.S. orbital flight. In it is a paper written by Chris Kraft, Tec Roberts, Gene Kranz, and myself, only I never wrote it.

WRIGHT: Ah-oh.

MATTHEWS: I never contributed to it. Somebody on the team, perhaps Chris, added my name to it because I like to think sort of that because of what I had contributed to the thing. So I've got a copy of that, but, as I say, I didn't write it.

WRIGHT: Were you happy with what you didn't write? [Laughter]

MATTHEWS: Yes. It was very good.

WRIGHT: It was going to have your name on it. Were you okay with that? That's good.

MATTHEWS: So I came to RCA as a project engineer. I'm sorry—as a—yes, I guess I was called a project engineer. And worked on a number of projects. RCA was one of these places that they like to say they invented over the transom. Somebody would give them an RFP [request for proposal] and they would immediately invent a response. They would do things that nobody else would take a try at.

One of the early things I got involved with was some work for von Braun's people, and having primarily to do with the Saturn V launch vehicle. In the early days, as I mentioned before, the Redstone arsenal, everything they recorded off their telemetry and so forth was analog. Well, for the Saturn V they changed over to digital, and they had stacks

and stacks and stacks, which they sent me, of digital output. Somewhere buried in that pile was any evidence as to whether there were any problems or not. To do it the old-fashioned way of plotting it out and looking for anomalies and so forth would just take too much time. They had tried it. The next vehicle would be on the launch pad, ready to go, before they figured out whether there was anything wrong with the previous one. So they couldn't stand that.

So our contract was to find a way of going through this automatically with a computer and finding out whether things were different than they expected or different than what was required, including their radar, comparing radar and telemetry and simulated results and analytical results, analysis, they had. So we put this whole thing together in a package of computer programs to run in a couple of hours, and using data from the previous launches we found all sorts of stuff that they hadn't had any idea of problems that were in there. So they received it with open arms.

At the time they received the results, headquarters told them to quit doing their own post-flight analysis and to put the onus on the stage contractors. Each stage contractor would have to do his own.

So a few years later, I saw a report in one of the technical journals about one of the stage operators, contractors, describing their post-flight analysis methodology, and it was obviously patterned after ours. NASA apparently had turned over the programs to their stage contractors. How I could tell it was patterned after ours is some of the nomenclature [for] describing certain tests and so forth, we had invented names, and they were the same names. [Laughter]

WRIGHT: So you were somewhat still affiliated with the space industry.

MATTHEWS: There were a couple of other minor contracts with them as well. One major contract was for an operational flight control system which was never explained by Huntsville as to why they were interested in this, but this was a Huntsville version of Mission Control for the booster. The only thing I could figure out was that they had hoped to use the Saturn for unmanned missions after it was used for Apollo to go somewhere in space and to do something, and that this was their first thoughts about how they would go about doing the Mission Control of the thing.

We had a general manager who was very thrilled that we had this contract, and so Dr. [Kurt H.] Debus was the head of the operations, the Saturn operations, down at the Cape, wanted to be briefed on this. So we went down, gave a briefing to him. I was sort of an auxiliary to this team that went down, because the project was well along when I had joined them. But they wanted me to go down anyway, particularly because I knew everybody down there.

So here's Dr. Debus in there, in this briefing, with all his cohorts. I knew every one of them in the room. Our general manager got up and said how important this study was to the company, and therefore he was very pleased to be here to give this presentation to the Air Force. There was a dead, dull silence across the room, and everybody started looking at me and sort of pointing at him, sort of mouthing, "Who's this guy?" And I tried to sneak under the table, pretending I wasn't there. [Laughter] He got a little confused.

WRIGHT: A little awkward for a moment, anyway. Gosh. Were you able to keep up with your fellow co-workers that were still at NASA, to keep up with what was going on in the space program, or did you just become so busy—

MATTHEWS: Len Packham was a very good friend of mine, and he was the technical coordinator for what RCA was doing on the LEM [lunar excursion module] program. LEM

started off as a paid study for a number of contractors, and Grumman and RCA teamed up and did an unpaid study, and their concept won out. They were awarded a contract to build on. So RCA was responsible for the rendezvous radar and for the ascent and descent guidance system. I was in on the first proposal for this, but after that I wasn't involved. I was off doing something else. But Len Packham was the technical coordinator for the Project, so I used to see him periodically. He'd appear at the plant.

We kept in touch with quite a few of them, particularly Arnie Aldrich and Len. Later on, John Hodge moved to the NASA center in Cambridge, and he just lived down the street from here, so we kept in touch with him. Tec Roberts, we kept in touch with him and others sort of off and on. Len Packham's wife became an exceptionally good friend of my wife. Len, of course, died some years ago, and we've lost touch with her. We think she may have passed away. She had Alzheimer's disease, and she had to give up writing. We talked to her son, or at least wrote to her son on a few occasions, but we never heard anything back as to what happened to her.

WRIGHT: There were so many people that you knew, I'm sure it's hard to keep up with them all.

MATTHEWS: Frank Thomas is gone. Gene Duret is gone. Jim Chamberlin. Funny thing about Jim. I'll always remember Jim on Gemini, he disappeared to McDonnell for almost a month when they were first defining what Gemini should do. Came home in the middle of the night, everybody was asleep. He didn't want to wake them up, so he slept on the couch in the living room. He had to get up early in the morning and take a flight to New York, so he didn't want to disturb anybody in the morning, so he just quietly sneaked out of the house and went to the airport before anybody was up. His wife came down, and the only evidence that

she had that he'd been home in a month was a pile of dirty laundry sitting in the middle of the room. [Laughter]

WRIGHT: Some of these wives had a great amount of patience, didn't they.

MATTHEWS: Particularly astronauts' wives. They were away more than anybody. We lived right across the street from Wally Schirra's, and he was away more than he was home.

WRIGHT: I guess that helped, being part of Stoneybrook extended family.

MATTHEWS: Yes, particularly with the three astronauts' wives there. They were very close. I saw Deke a couple of years ago. Deke's passed on, too. I saw Deke Slayton a few years ago at Reno Air Races. He had his little Formula One. You could put the airplane in this room. He was racing it in the Formula One race. I had a chance to talk to him for a bit, and that was the last time I'd seen him.

WRIGHT: I'm sure that was a good time for both of you to renew those old friendships.

MATTHEWS: Yes. So anyway, at RCA then I got off into doing other things other than—oh, airplane-related, not space-related, I got involved in configuring and doing a selection for the next version of the Air Force's Advanced Airborne Command Post. They had a command post in EC-135s, and we put the first computer into an EC-135. So we did this study for which airplane should they have, an L-1011, a C-5A, a 747, DC-8, DC-8 stretched, and so forth. They finally picked the 747, so we did some further studies as to how to configure it and so forth.

After that, most of my work was on other things like some intelligence systems and some automatic test systems and so forth. Then I got into doing their engineering procedures for RCA-Burlington [Massachusetts], and they ended up being adopted by GE Aerospace in general.

WRIGHT: You started out at pursuing your interest in airplanes, and with RCA you were able to go back and work with that again.

MATTHEWS: Yes, for a while there. At the end it got pretty far away from airplanes or space.

WRIGHT: Now what are you doing to fill your busy days?

MATTHEWS: I retired in 1991. GE had taken over RCA a couple of years before, and they decided they were going to close down some of the operations, so one of the operations they decided they were going to close down was Burlington. What they did was distribute the various projects to other plants, and so the handwriting was on the wall that it was going to close, so they started giving layoff notices to various people. They gave me a choice of staying on or taking retirement. It wasn't early; I was already past sixty-five. Taking retirement. They had a retirement package. So there wasn't much exciting left, so I decided, what the heck, might as well take retirement. So I retired in '91.

Then almost immediately, within a few weeks, I got a call from somebody that had been at RCA, had gone to Aeronautical Radio. In fact, the president of the company was an ex-RCA chap, had been general manager there. So I got a call from him saying they needed some help. They were run by the airlines, Aeronautical Radio, Incorporated, owned and run by the airlines, and the airlines were interested in using the new technology called global positioning system, GPS, for their navigation. So ARINC was pretty cognizant. They'd been

following the GPS development for some time. So they needed some help, so I went down there and ended up with several contracts with them for a couple of years, including one contract to do their system engineering procedures for them, develop a handbook for them. Did that.

Then did some work for Sanders, who ended up being owned by Lockheed, in terms of doing some systems engineering work for them. Then got involved with ARINC again, a proposal. And then the last couple of years I've been doing system engineering for an outfit called American Science and Engineering. What they do is they build X-ray systems, big commercial X-ray systems, and these X-ray systems are used by Customs. Various governments around the world use them for Customs inspections of trucks or big ISO containers or pallets, what have you. So I did a couple of years' work, year and a half work for them. The last project I was on was over last month, so now I'm back to retirement. This work for AS&E was just part time, like five days a week. [Laughter]

WRIGHT: Instead of your normal—

MATTHEWS: Finally cut down to about three days a week.

WRIGHT: You certainly have had a diversity since the time from AVRO till the time now.

MATTHEWS: Yes, yes. I don't think I've ever done anything the same twice.

WRIGHT: As long as it's correct each time, right?

MATTHEWS: Yes.

WRIGHT: Looking back through your time with NASA, it seems so long ago, can you remember one of the greatest challenges that you had in that time?

MATTHEWS: Yes. The biggest challenge, I sort of hinted at it earlier, was to keep your sense of humor. [Laughter] And not let it all get to you.

WRIGHT: Hopefully you didn't have too many encounters with people who maybe didn't have as quick a sense of humor as yours.

MATTHEWS: There was only one instance where I had problems with people, and that was the worldwide range was under contract not to the Space Task Group, but was under contract to Langley Research Center Instrument Lab, instrument group, and they were the ones that put the solicitation out and the requirements out and got the bids back and so forth. We were party to the selection process and so forth, but it wasn't our contract.

However, when it came time to evaluate the down-range system configuration for the flight controllers, the consoles and so forth, the contractor set up a—I think it was Westinghouse. I'm not sure now. Set it up at Wallops Island, and somebody from the Instrument Lab and myself went up to evaluate this, as to whether it was acceptable or not. He embarrassed me by stating that all contractors were crooks, and that he was going to make sure that they toed the line and they did things the way he wanted them to do. I accepted the station essentially as it was. I think there were a couple of minor comments I had. All of his comments were essentially ignored. But he was difficult to deal with. Everybody else I had no problems with.

WRIGHT: Glad to hear that, with such a varied career, that you were able to have good working conditions and good co-workers and such a good success.

MATTHEWS: Yes.

WRIGHT: I was going to ask Carol if she had any questions for you, if you don't mind.

BUTLER: I have a couple of questions.

MATTHEWS: Sure thing.

BUTLER: One of them, talking about the Worldwide Network, you mentioned a couple incidences here or there or events going on, and you talked about the arrangement with the Bermuda government, how there were certain arrangements there. When you were trying to set up that network and finding—one is, how did you pick the places to go, and then, two, did you have any problems with the other governments, with bringing people in?

MATTHEWS: Well, the picking of the sites was done primarily by the contractor, a joint effort between the contractor, Langley Instrument Lab, who were letting contracts, and by the advice and inputs from the Ops Division, having to do with trajectories. It wasn't so much the flight control aspect having much to do with where the sites were, but the trajectory people in the Ops Division had a lot to say about where they should be, because they were the ones that would end up defining the coverage that the communications and radars would have for a given site. "On this trajectory, oops, we missed that. If we put it there, we'll miss it." [Laughter] Okay? But if we put it there, it'll go right through the center of the station coverage. So they had a lot to do with it. Flight control didn't have much to do with it.

The second part of your question was?

BUTLER: Setting it up, were there any problems with the other governments?

MATTHEWS: The other governments. That I don't know. That would have been—not that I know of. There was one instance, though, where the State Department gave us, when we started to get involved with the Worldwide Network, State Department gave us some suggested rules of conduct and so forth, as to how to operate in those. A State [Department] representative came down from Washington to give a briefing, in particular about Zanzibar, which there was a lot of unrest, as to what we should do if there was a coup or what have you. The interesting thing was that eventually they moved the station from out of Zanzibar, but before that, we had no problems. But he did. He was captured in a coup. The one that was coming, giving us the warning, was captured in a coup and held for some short period of time.

BUTLER: Well, hopefully his advice paid off for himself, then.

MATTHEWS: I was thinking that.

BUTLER: Oh, my. That's quite an interesting situation. Luckily, you didn't have any problems.

MATTHEWS: Yes.

BUTLER: Another question. You mentioned the Redstone was used in most of the early flights, but then for the orbital flights it moved into the Atlas. Was there much discussion or concern about the Atlas, and that in so many of the early tests—

MATTHEWS: Yes, yes. The Atlas had a dismal reliability record, and so there was a lot of effort put into trying to up its reliability. One of the most effective means they found was to put placards on all the bits and pieces that were going through the assembly, that said "This goes on the vehicle that's going to be used by" and they put the astronaut's name on it, like Glenn or what have you. And they found that the reliability went soaring, because people took that much more care.

When we first went to NASA, I have heard that we were brought into the States under the same provisions of von Braun and his people, because we were just ushered in, you know. We had no problems with immigration or anything. We went down to the embassy and told them who we were, and a piece of paper, and they'd already been notified who we were. The skids were greased. So we had no problems. The moment we got there, we were given security clearances equivalent to our Canadian security clearances. The only people that wouldn't recognize this for some time, until they got their arms twisted, was the Air Force on the Atlas Program, because it was the ICBM [intercontinental ballistic missile] program. They said, "Nuh-uh. A NASA version of a Canadian clearance isn't good enough," because we were all Canadian citizens at the time. I'm a dual citizen now. But you can't give up your Canadian citizenship unless you pay money.

So this was one instance of the Canadian citizenship being a problem. The other one was State Department were horrified that some of the flight controllers were going to be going around the world on Canadian passports and not government passports, because the government passports, if you were going to Kano, Nigeria, would let you get into Kano, Nigeria, and let you get out again and come home. Wouldn't let you go anywhere else. So if you're going to Australia, it let you get into Australia and out of Australia; wouldn't let you go anywhere else. So they had control of where everybody was going. This didn't matter at all about going to Australia, but they were worried about some of the African places and so forth like this, people wandering around. So the Canadian passports had no restrictions on

them whatsoever, just said, "Be careful if you go to Russia or be careful if you go to so and so," but you could go to Cuba, but it said, "Be careful if you go to Cuba." But there were no restrictions on it. The State Department had a fit.

BUTLER: That's interesting. That's really interesting. And there must have been some concern, too, because I guess if you were in a place that might be more dangerous, like some of the ones with unrest, that by having a government passport it gave you a little more authority, whereas if you didn't have that, they might not believe what you were trying to tell them. Interesting.

WRIGHT: Did that situation get corrected?

MATTHEWS: Well, eventually some people became citizens, so then they could use their American passport. I can still get a Canadian passport, but if I use it, I've got to go and exit from a Canadian port.

BUTLER: Interesting.

MATTHEWS: I don't have one, but I could get one.

BUTLER: One last question from me. Even though you weren't involved with NASA and hadn't been for a while, did you watch the moon landing carefully, the Apollo 11 landing? Do you remember watching that at all?

MATTHEWS: No, I don't think I watched it live. I did after the fact. There's an interesting thing, now that you bring this up. When I left AVRO, having been dumped by the

government, I had a hard time thinking about airplanes or getting involved with them in any sense or fashion. I didn't want anything to do with airplanes. Just brought back too many memories. And it was sort of the same way at NASA, softened somewhat because I had contacts. I kept up contacts with so many of the guys and they kept sending me stuff and so on and so forth. But I had a hard time for a long, long time trying to really dig into what was going on, just simply because it brought back too many memories.

BUTLER: That's completely understandable. You'd put a lot of work into it, to make it all—

WRIGHT: Can you pick a favorite time of your career that you're really glad you had an opportunity to be a part of?

MATTHEWS: Oh, I think it was all, right from the beginning. The whole thing was something I wouldn't want to give up at all. It was sort of like a mosaic, a little bit here, a little bit there, and a little bit somewhere else, and all made this big experience.

WRIGHT: And now we understanding you're going to be traveling in a couple of months to visit Canada. Can you tell us about those festivities and why they're so important to you?

MATTHEWS: AVRO ceased to exist in the sixties, early sixties. It downsized with this big layoff in '59 and tried to struggle back, but didn't. The engine company is still in business. But in spite of this, they keep having reunions periodically, first flight of the Arrow, first flight of the C-100, what have you, or fortieth anniversary of the first flight of the Jetliner.

This year it's the fiftieth anniversary of the first flight of the Jetliner, August 10, 1949, eight to ten years ahead of anything else flying. It was the second jet transport in the continent, I mean in the world. Comet beat us by two weeks to be the first in the world. I

say they cheated; they just ran down the runway and lifted off and touched down again. But the chief designer is a little more polite than that, of the Jetliner; he says we were second.

But anyway, it's the fiftieth anniversary of the first flight, so a year or so ago they had an anniversary for something on the Arrow and 600 people showed up. That's since 1959. So I don't know how many people will show up this year. I don't know. There are fewer people left involved with the Jetliner than there were with the Arrow, which was ten years later. So I expect about 200 people will probably show up, 200 or 300 people.

WRIGHT: That sounds like it's going to be a great time to be there and a chance to renew old friendships and maybe start a few new ones.

MATTHEWS: Yes, yes. So it will be interesting.

WRIGHT: We wish you a good time.

MATTHEWS: Thank you. And I appreciate this opportunity to talk with you and put some of the thoughts and memories down so that other people can see some of the aspects of what was going on.

WRIGHT: You had too much to offer, so we certainly appreciate the time that you've given us to collect some of those.

MATTHEWS: You're welcome.

[discussion of memorabilia, photos, models, etc. follows]

WRIGHT: So this is the Project Mercury Flight Controller Handbook.

MATTHEWS: Yes. We were talking earlier about the Flight Controller Handbook and how it originated and so forth. When the first copy arrived from the printer's, it was distributed around among the flight controllers, and one of the flight controllers, Arnie Aldrich, came running into my office and saying, "The cover! The cover! There's a mistake on it!" And I looked at it and I looked at it and I looked at it, and I couldn't find it. Finally he pointed it out to me. It says "National Aeronautical and Space Administration" instead of "National Aeronautics and Space Administration." And I never spotted it. So he said, "What are we going to do? Are we going to get them to redo the covers?" And I said, "No. It took me so long to find the mistake, I don't think anybody else is going to notice it." So we distributed it, including headquarters and so forth. We never heard "boo" back from anybody. So I don't know whether anybody else other than Arnie ever caught it. [Laughter]

WRIGHT: It showed he was a man for details.

MATTHEWS: So that was how it started. There is no words to this, or very few words. There is the general environmental control system, and it tells you what the astronaut can see and it tells you what the ground controllers can see. This is on telemetry. So that's the general picture. Here is one of the modes that you can put the system in. Here's another mode you can put the system in. Here's another mode you can put the system in, and so forth, and away it goes on, page after page after page. These are all the further parts of the thing.

One of the things that's interesting about this, you can see by the time we'd done this, we knew everything about the spacecraft. I met Chris Kraft a number of years later after he'd become director of the Manned Spacecraft Center. I was down visiting on business somewhere else in the area, and dropped in to see him. We were sitting there talking about the good old days, and he said, "Have you been into the new Mission Control Center?" And

I said, "No, but one of my old controllers said he was going to take me in and show me around." Chris says, "You'd feel right at home. It's much bigger and it's got all sorts of things added to it, but the core of the operation is identical to the old Mercury Mission Control Center." He said, "You'd feel right at home." And then he paused for a minute and he said, "There is one difference." He said, "Remember in the old days we knew everything in the capsule, all the systems in the capsule? We knew all the communications, we knew all the telemetry, we knew what was in the Mission Control Center?" He said, "Everything in those days was hard-wired. These days everything goes through a computer. These days, only your programmer knows how it works." [Laughter]

WRIGHT: That must have been quite a compliment to you, to see your work still in existence, just took on a different look.

MATTHEWS: Here's the attitude control system, one of the modes. There's the automatic version of it. And here's the direct manual version of it and so forth. You can see what he can see and what he can do, and down here is some notes about the thing and so forth.

We had to get this printed up by McDonnell. The government printing presses couldn't handle it. It's twelve different colors in here.

WRIGHT: Many, many years before color printers, that's for sure.

MATTHEWS: Yes. So anyway, that's all the different—

WRIGHT: I noticed on the front page that this is copy number 65. Do you remember the original number, how many were distributed on the first—

MATTHEWS: No. That's the very first issue.

WRIGHT: December 1960. December first.

MATTHEWS: It went to all the astronauts, went to all the flight controllers, went to the project office, went to headquarters, and so forth.

WRIGHT: These were controlled because they were issued?

MATTHEWS: Yes. I mentioned the trailer. Here's the trailer. This is all the technical description of the big trailer, that interim Mission Control Center. I've got some photographs of it somewhere. That doesn't mean much there without the—that's Arnie Aldrich. He's from Lexington, by the way. These are some pictures. There's the original astronauts. There they are again. I've got to put captions on some of these things. I'm not sure which one that is. Remember I told you about the "JETT RETRO"—

WRIGHT: And the "FIRE RETRO."

MATTHEWS: Yes. "FIRE RETRO," "JETT RETRO."

BUTLER: You could easily confuse those.

MATTHEWS: Yes. And there's the trailer. There's the big trailer. Here's—where is it? Where did it go? There it is. It's got a little different model on it.

WRIGHT: Very small model. What scale is this?

MATTHEWS: I have no idea.

WRIGHT: Very tiny scale of an 18-wheeler.

MATTHEWS: That isn't quite that trailer, but it's close enough.

WRIGHT: Close enough.

MATTHEWS: There's Redstone on the launch pad. How simple the gantries are in those days.

WRIGHT: Did you witness many of the launches?

MATTHEWS: Several of them. There's the Mission Control Center. Here's Arnie Aldrich again. There's the remote flight monitoring control station. There's the capsule communicator. There's the medical and there's the systems. The medical guy's got a strip chart recorder here, playing out EKGs [electrocardiogram] and things like that.

BUTLER: Something so basic, but yet so important. It's just a small center here, but had to have it.

MATTHEWS: And there's the simulator at Langley Field. I got in there one day and the operator, the trainer here, I was playing the part of an astronaut, and I didn't realize they could—I knew they could put some faults into the thing, but I didn't realize they could put smoke in there as well. All of a sudden I'm sitting there, and all of a sudden there's smoke

starts to come up [around]. You never saw anybody get out of anything so fast in all your life. I'm standing over here. [Laughter]

There's the Redstone launch blockhouse. That's where I was thinking of putting the stuff for the interim. This is John Glenn's—

WRIGHT: Twentieth day.

MATTHEWS: And that was off the teletype in my office. This is Saturn V. There are all my flight controllers from Philco-Ford.

WRIGHT: Your traveling crew. A lot of these are the traveling crew; they traveled everywhere.

MATTHEWS: Yes. A couple of them ended up down in the Mission Control Center, I think, but most of them were assigned around the world.

I don't know what this is, but this is up in Nashua [New Hampshire]. I found it in the weeds a couple of years ago. [Laughter]

WRIGHT: Some former cabinet for—

MATTHEWS: Something. There's guess who. There's Dennis [E.] Fielder. There's Bob Ernull, who was a first lieutenant in the Army, who was on loan to NASA.

WRIGHT: This is?

MATTHEWS: That's a globe.

WRIGHT: Look at that.

MATTHEWS: A transparent globe. It's more than that. It's got the star. I guess the globe's down inside. I don't remember. This wasn't really my office. My office was across the hall. I don't know why I'm in this particular—

WRIGHT: It's a great picture. It's okay.

MATTHEWS: This office was strange. Two things interesting about it. One was that it's in one of the two first NACA buildings built in 1918, when NACA first started up. They're in TAC territory, Tactical Air Command's area of Langley Field. There are some other NASA buildings, NACA-NASA buildings on the same site, a couple of wind tunnels. There's a window here, and outside the window is a narrow, very narrow driveway.

On the opposite side of it is a blow-down tunnel, and this is one of these tunnels with a huge sphere that they evacuate and then they open up a valve that lets the air, ambient air, go rushing into this evacuated sphere, and goes through a very narrow test chamber at supersonic speeds so they can put a model in there and measure its reaction to these supersonic speeds.

This makes a huge bang. Sounds like a cannon going off when they open this valve and all this air goes rushing in. Before they would open the valve, they would sound [a] siren to warn you, but the timing was terrible. All it would do was give you enough warning to look up, say, "What's that?" and wham! And you'd end up hanging onto the chandeliers. [Laughter]

And the other thing was, this was the second of two buildings. The first one had Bob Gilruth's office and others in it. The Ops Division had most of the second building. In that

first building there was a big rotunda, and it had the most marvelous mural of the history of aviation from the times of early balloon flights all the way up to the present.

Some years later, I was working on a contract with Tactical Air Command, and went down and visited a colonel in this building. I had to check into the front building, into the rotunda. They had taken a paint roller and obliterated entirely this old classic mural of aviation history.

WRIGHT: What a loss.

MATTHEWS: That's the Air Force for you.

WRIGHT: What a loss.

BUTLER: Unbelievable.

MATTHEWS: There's Wally Schirra's house across from ours. Our house was right there.

WRIGHT: You mentioned Dr. Gilruth. Did you have a chance to work with him very closely?

MATTHEWS: No, not particularly. He was pretty well far removed from the dirty everyday details of things. But I met him on an airplane several years after I'd left, and I was with RCA four or five years, I guess. So we were chatting, and he remembered I'd gone with RCA, and he said, "You know, I get all sorts of people coming in here saying they're from RCA and want to do studies or work on things." He said, "I've never been able to figure out RCA organization, who does what." This was because RCA was—each plant was its own

profit center, so it had limited resources. It was tough for a big project to get these various resource centers together to bid on a big part of the project, so all these little individual profit center salesmen and so forth or engineers would wander in and say they were from RCA and they were representing one little part of it.

There's them pulling Gus Grissom's thing out.

WRIGHT: Did you hear a report earlier this year that a gentleman had located the capsule?

MATTHEWS: Yes. They haven't got it out yet. Betty Grissom doesn't want the—first of all, said she didn't want them to bring it up, and then she said, well, if they bring it up, she wants it preserved. No, that's Shepard's, because they never did pull Grissom's capsule out.

That's Shepard's, too. There's Shepard climbing up into the helicopter. There he is. There he is there.

BUTLER: That's quite a job to hang out of the helicopter and take those pictures. [Laughter]

MATTHEWS: There's Shepard's as well. These are all Shepard's. There it is, liftoff. There it is, liftoff as well. Here's a whole series of these. This is Grissom's flight. There's the helicopter trying to pull. See where he is in the water? He's got his wheels right in the water and he finally—and Gus is somewhere down in here. This one, you can't quite see him, but there's another picture somewhere that you can see him.

There's Glenn. There's the Mission Control Center again. There's the telemetry back room. There's an anthropomorphic description of how you fit into your seat and so forth.

WRIGHT: Speaking of John Glenn, did you watch his latest flight that was just in October?

MATTHEWS: Yes, I saw it on the TV. I was working at the time, but I saw it on TV afterwards. More power to him. [Laughter]

Here's some more pictures. This is the old CF-100. This is the one, if I hadn't had a cold, when it crashed, I would have been in it.

Here's the inside of a big Mission Control, the interim Mission Control thing, in a truck.

Here's one that will make you laugh. "I know your son is a genius, but I really don't think RCA can afford to start production on its proposal immediately. Plan for rocket. Spring for bouncy landings, one of Mom's dining room chairs, one million firecrackers." [Laughter] My son drew that.

WRIGHT: How old was he when he drew that?

MATTHEWS: Sixteen, seventeen. Seventeen, maybe.

WRIGHT: And he inherited that sense of humor.

MATTHEWS: He's a vice president for Warner Brothers, works for Bugs Bunny, which is really weird, because when he was four years old I painted a four-foot Bugs Bunny on this bedroom wall. Now he works for him.

There's the original spec for the interim Mission Control Center. That was from that diagram. That's what they went and built. They built all of that stuff I showed you earlier. If you compare it, it's pretty close.

There's the Control Center layout of who sits where. There's Bermuda's version. I went back to Bermuda six years ago, called them up and said who I was, said, "Can I come down, take a peek?" They said, "Come on down." Sent a car out for me because it's a secure

area. They came out to the gate and got me and took me down. The site manager had been there all this time, since the station started, and he remembered me all this time later.

BUTLER: That's pretty neat.

WRIGHT: Is this equipment somewhere still there?

MATTHEWS: No, they closed it down last year. The station's closed now.

WRIGHT: I wonder where it went off to.

MATTHEWS: I don't know. I guess with all the satellite coverage, they don't need it.

There is the trajectory plots at Bermuda. This is just a Redstone flight plan, tentative flight plan.

WRIGHT: Is this your sketching?

MATTHEWS: Yes. I have no idea what date it is or anything.

WRIGHT: There's a date right there. '59.

MATTHEWS: '59. 5/6/59. This is that paper I told you that I wrote for the Apollo, and to the publications people it was under Kraft's name.

WRIGHT: We notice it's the Apollo Conference in Washington, July 18 through the 20th, 1961.

MATTHEWS: Yes, that's right. This was the draft that went into the pubs people to make up.

This is the escape rocket.

One of the things I did was, in the early days, I was named as the first chairman of the Cape Safety Committee. It soon became clear that you couldn't do this from up at Langley Field. It had to be somebody from the Cape to do it. So after the first meeting, somebody else picked the chore up. In the first meeting, one of the things we decided to do was to clear the area, the footprint where if you aborted off the pad, where would the capsule land, depending on the wind. So that made a footprint. The idea was to clear that footprint of all the mangrove and all the junk that was in there, because they found they couldn't get in. A rescue team just couldn't penetrate. So the first job was to clear that area out. In clearing it out, they found a six-foot snake.

There's the capsule console again. There's the remote site again. I guess this is after Glenn's flight. There's the astronauts again. There's Gus. There's the capsule down there, and I think that's Gus, but I'm not sure.

WRIGHT: That's one happy man to get aboard that carrier, wasn't he.

MATTHEWS: Yes. One of the things, Colonel Stan [Stanley C.] White and I went up to the Lovelace Committee to give a presentation. It was primarily Stan's presentation. The Lovelace Committee was General Don [D.] Flickinger and a bunch of others who were concerned about man's role in manned space. This was an agenda of the presentation. I just went up to give them the general information about the mission, and Stan was to tell them about the medical aspects. This was done sometime later, to describe a mission and who's doing what.

This is just a "You're going to be working over Christmas. Thanks, guys." That's from Walt [Walter C.] Williams, who was head of the—

WRIGHT: Just in case you had a doubt, right?

MATTHEWS: There's a list of the various kinds of training for the flight controllers. Here's the designation of flight directors: Chris Kraft, John Hodge, me, flight surgeon Stan White. I think it was John [James P.] Henry. No, it may have been Jim. I can't remember Henry's first name. He was the one in charge of all the chimpanzees and so forth. And Bill [William S.] Augerson. He was the first doctor for the astronauts. And Tom [Thomas V.] Chambers, he was from Toronto, from AVRO. Tec Roberts. Jack Cohen was from Toronto. Glynn [S.] Lunney. Howard [C.] Kyle. So that was back in 1960, first of 1960.

WRIGHT: February of 1960.

MATTHEWS: Yes. They were starting to get organized. This is George [M.] Low. He's passed away now. This was a conference after John. There's the big hotel on the peninsula. Here's the agenda for that NASA—

WRIGHT: Apollo.

MATTHEWS: Apollo thing. Here is the first Apollo mission design at the time. There's some of the astronauts. Here's some pictures. There's that thing again. Here's this operational flight control system I said that was wishful thinking on Huntsville's part. That's about it.

But there's one interesting thing here. Another small world. This year I was working at AS&E, and talking to one of the physicists there whose father worked at Raytheon, and

who had worked on the original concept for Apollo. This is a copy. He ran me off a copy of this hand-drawn thing. "Three Basic Systems on Lunar Landing, Mission Profiles for Comparison." One of these has a LEM-like—yes, I guess that's the one with the LEM. Has it got a LEM on it? It isn't called LEM.

BUTLER: Over here it looks like there's something come up from the surface and docking.

MATTHEWS: Yes. It's not called the LEM. Isn't that interesting.

BUTLER: That's neat.

MATTHEWS: Again, small world. This is a series of books called *Canada Heirlooms: Wayfarers, Canadian Achievers*, and there's a whole article in here about "Canada's Gift to NASA." And it talks about Jim Chamberlin and so on. And here's my name in here somewhere. Photographs of NASA via me. My name's in here, Fred Matthews.

WRIGHT: That's really nice.

MATTHEWS: John Hodge, Tec Roberts, so forth.

WRIGHT: America was blessed with a great group of guys from Canada.

MATTHEWS: Yes. We tried our best. [Tape recorder turned off.]

Here's the one I wrote. [Laughter] Flight control and flight plans. Didn't write.

There was a whole bunch of Canadian and American legislatures came down for a briefing, and I gave a pitch to them. So I got a letter back from this Canadian senator, which

I thought was kind of ironic, because he was one of the principal politicians who canceled the project that caused 14,000 people to get laid off. So I thought it was kind of ironic that he wrote me.

Those are the little horses, wild horses on Chincoteague Island near Wallops Island, where each year they sell them off. They take the proceeds for the local—I think it's for the local fire departments or something.

This is me in the Air Force. [Laughter] Years and years ago.

Here's my reconstruction of that paper that somebody stole. As best I can tell, that's a fair reproduction of it. Fairly close. Yes, I was right. Sixteen stations. What's this?

WRIGHT: Medical support.

MATTHEWS: This is the briefing to Lovelace Committee in Washington, medical briefing. I didn't know I had that. Here's the Navy doctor, flight surgeon who did the appendicitis operation.

WRIGHT: I bet that sailor remembers him well.

MATTHEWS: I'll bet so.

BUTLER: It's a good thing he was there.

MATTHEWS: These are just all miscellaneous stuff. This is the safety thing. I was chairman of the first one, but later on somebody from the Cape took it over.

Here's some flight controller information. Here's the stuff that I mentioned about the briefing notes for guidance of personnel assigned to overseas locations, put out by the State Department and briefed to us by the guy that got captured. [Laughter]

There's the look-see at trying to stuff our things into the Redstone blockhouse, which I said, "Isn't enough room. Can't do that." So I gave up on that.

There is an overview of the various teams. There's a remote team and so forth. And so it goes. More and more. There's the presentation that Arnie Aldrich and I gave to McDonnell, to tell them how to hook up the—there it is. Flight monitoring trailer. How to hook it up to the rest of the world.

BUTLER: What I think is so interesting, all these documents that you're showing us, they're all mostly drawn by hand and very carefully, where nowadays we just do everything on the computer.

MATTHEWS: Yes. Exactly.

BUTLER: That's fascinating.

MATTHEWS: Here's an interesting document. Gilruth. Bob Gilruth. This is when he was in NACA, probably a struggling engineer in NACA back in his early days of working for Langley Research Center. There's no date on it, either.

WRIGHT: This is report number 715.

MATTHEWS: Or is there?

WRIGHT: Is that 1941?

MATTHEWS: Yes, that's what it is. 1941.

BUTLER: My goodness.

MATTHEWS: And I had this in my files at AVRO, so I knew of Gilruth and I knew of Chris Kraft, because I had a couple of reports of his, too.

Anyway, that's it, kids.

BUTLER: Thank you.

[End of interview]