ORAL HISTORY TRANSCRIPT

A. DUANE CATTERSON
INTERVIEWED BY CAROL BUTLER
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BUTLER: Today is February 17, 2000. This oral history with Duane Catterson is being conducted at the offices of the Signal Corporation for the Johnson Space Center Oral History Project. Carol Butler is the interviewer, and is assisted by Kevin Rusnak and Rob Coyle.

Thank you very much, Dr. Catterson, for joining us today.

CATTERSON: It's my pleasure.

BUTLER: To begin with, if maybe you could tell us a little bit about how you were interested in going into medicine and then specifically aviation medicine, how that all came about for you.

CATTERSON: Gladly. I grew up in a doctor's family. My grandfather was a family doctor, a horse-and-buggy doctor, actually, around the turn of the century. My decision to go to medical school, or to try to go to medical school, came late. I started out as an engineer, but was romancing a girl who I decided would rather be married to a doctor.

As I looked at engineering right after World War II, this probably sounds unbelievable now, but they were having convocations of the students in the engineering school and encouraging people to change their major, because they said there was going to be a glut of engineers, so at the time you graduate there won't be any jobs. Of course, actually the reverse was true; they were hiring people before they got their degrees because the economy was booming so much.

I started to college in 1947, but I did change my major for a variety of reasons. I felt that I would be maybe more useful in medicine than in engineering, all things considered. I got into medical school after four years of pre-med. My girl and I got married my senior year of college, and by the time I was a freshmen medical student we had a son, so it was lucky thing I got into something that was going to pay the bills eventually.

Once I graduated from medical school, which was in 1955, things were changing rapidly even then in medicine, and the idea of being a general practitioner and trying to be all things to all patients was daunting. It was just too much to try encompass, as far as I was concerned. The various specialties that existed, nothing really lit a fire under my enthusiasm.

The doctor draft law was in effect, and everybody who was able-bodied was going into the military eventually at that time, so I applied for a military internship and by some quirk of fate was selected for an Air Force, or accepted for an Air Force internship, and went directly from medical school into the commissioned grade as a lieutenant in the Air Force and to an Army hospital for my internship.

During that period, I became impressed that there were rumors of a space program and of trying to put a man in space in the Air Force circles. I had been a space enthusiast as a daydreamer throughout my whole childhood, used to play at Buck Rogers as kids. We used to go out and instead of making snow angels in Denver, we'd stamp a rocket ship in the snow and play in that. So this was a lure and it sort of solved my problem, you know, what do I want to do in medicine. I thought that if there was a legitimate opportunity to specialize in aviation medicine, that's what I wanted to do and I set my cap in that direction.

The Air Force cooperated and sent me to the—accepted my application to a basic course in aviation medicine, right after…I completed [the] internship, and that at that time [the course] was still at Randolph Field in San Antonio [Texas]. Dr. Charles [A.] Berry was one of the faculty members of the school as I went through it. The course was brief, it was about two months of orientation and training to become aviation medical examiners in the

Air Force. But I was inspired by his enthusiasm about aviation medicine as a legitimate goal and branch of practice and the philosophy that the flight surgeon was an integral part of the flight organization and had a lot to contribute towards keeping people flying and avoiding problems by being proactive, on the scene.

I was assigned to a Strategic Air Command base, large SAC base, and was supposed to be in training for going on to specialize in aviation medicine, which I'd told the Air Force professional people I would like to do. So I spent two years out in Southern California as a flight surgeon in the Air Force.

Then during that time there was a reduction in the size of the military forces, budget cuts, not too dissimilar to what's been going on in the [Bill] Clinton administration, but this was initiated by President [Dwight D.] Eisenhower, and regular commissions in the armed services were frozen. You had to have a regular commission to get into a residency training program as a medical officer, so I was sort of in a Catch-22 situation. I did apply for the Air Force residency in aviation medicine and they sort of interviewed me and said, "Well, there's a good chance if you just sign on as an indefinite reserve officer that those rules are going to be relaxed and that you could still get the residency." But that sounded like the check was in the mail to me.

So at the end of my two-year commitment I separated from active duty and went into the inactive reserves in the Air Force, and applied for aviation medical training as a civilian at Ohio State University [Columbus, Ohio], which was the only civilian residency. It was kind of a token civilian program in aviation medicine, because the program was essentially a program that was invented to meet the needs of the military services at the time.

I very much enjoyed the two years of graduate school at Ohio State, and they had been conversing with Dr. [W.] Randolph Lovelace [II], who was the founder of the Lovelace Clinic in Albuquerque, New Mexico, about sending a resident there for the obligatory third year, which was a year of supervised practice in the field of aviation medicine. All the third-

year residents in the field prior to my training there had gone to Pan American Airways headquarters in New York and worked with the medical department there doing pilot physical exams and occupational medical care of Pan American's employees.

The Lovelace Clinic had just completed doing the initial astronaut selection examinations under a contract from NASA, and, you know, that had a lot more appeal to me, so I lobbied to go to Albuquerque and that worked out. I actually got transferred to the Lovelace Foundation for that third year and took my training there under the supervision of a retired Air Force general, Dr. Al Schwichtenberg, who had been the command surgeon for the Air Defense Command and was, again, an enthusiastic flight surgeon.

Dr. Lovelace was one of the originators of aviation medicine in the United States and had served on a task force to develop aviation medical capabilities that was organized up at the Mayo Clinic [Rochester, Minnesota] where he was on staff during the war. Then he left Mayo, as did many leading doctors after the war, and set up a clinic in Albuquerque that was modeled in concept after the Mayo organization. But he also set up a foundation that was dedicated to research, and the Department of Aerospace Medicine was a part of that foundation, so we didn't have day-to-day clinical responsibilities, but to me it seemed like an ideal learning platform.

Dr. Lovelace had attracted people from the military service and from backgrounds mostly in Army Air Corps to join him at that center. One of my mentors for the year was Dr. Ulrich Luft, who was actually part of the group of German scientists who came to the States after World War II with Wernher von Braun. He had been the chief of aviation physiology for the German Air Force throughout World War II, and was a marvelous and patient teacher of the physiology of aviation. I couldn't have fallen into better hands. A very gentle man, who didn't know his own strengths. He was given to rushing over to show me something that he thought was exciting in a medical journal, shoving in front of me and say, "Look what they said here," and it was in German. [Laughter] I'd have to remind him that I had minored

in German in college, but I wasn't up to reading a scientific—sight-reading a scientific article.

But I had a good year there, and during that year Dr. Schwichtenberg wrote sort of a flattering endorsement to NASA saying that I was a fellow they ought to hire. I was contacted by Dr. Berry, who, unbeknownst to me, was taking a position with NASA at that time and was actually forming the medical operations office staff. So he met with me at a meeting of the Aerospace Medical Association, annual scientific meeting in Atlantic City [New Jersey] at some ungodly hour in the morning, like seven o'clock, for breakfast, and he laid out what the organization would be doing and what the job would envision as he saw it. I would have paid NASA to be able to work for them at that point. I was just dying for a chance, and so I accepted his offer of a position on that staff as an assistant. It was a very small organization. There were five people, I think, counting Dr. Berry, in the original medical operations office.

BUTLER: None of the astronauts had flown yet at this point, is that correct?

CATTERSON: Yes, they had. Al [Alan B.] Shepard [Jr.] and [Virgil I.] Gus Grissom had flown. John [H.] Glenn's [Jr.] flight occurred while I was in Albuquerque in 1961. I think that was the year that he flew. Anyway, it was during the time of my tenure at Lovelace.

One of the contracts that the Lovelace Foundation had was to evaluate telemetry data that the Air Force was gathering from the Russian early cosmonaut flights, orbital flights of the cosmonauts. So I was handed an electrocardiogram and voice transcript data and other physiological data to comb through from Yuri Gagarin's flight and Gherman Titov, the first two Russian cosmonauts.

BUTLER: That must have been interesting.

CATTERSON: It was fascinating. I kept wondering how did they do this, but I wasn't supposed to know, so I just accepted the fact that it was legitimate stuff and went on from there. It was an Air Force contract, so security was on a need-to-know basis. They figured that this guy who was looking at the heart rate didn't need to know how it happened to fall into our hands.

BUTLER: Were there any surprises as you were looking at those?

CATTERSON: Well, there were curious coincidences, as it turned out. Gherman Titov became nauseated and panicky during his flight. I think that's an appropriate word to describe the situation. He vomited in the course of the flight, and he had some irregularities in his electrocardiogram that were really expressions of normal physiology under those circumstances, those conditions. It was pretty easy to see what was going on, even for a green resident in the field, by looking at his conversation with ground control and his heart rate and his breathing rate, and you could just about tell when he stopped to throw up. It was amazing how that whole thing went together.

But in John Glenn's flight, he did throw some abnormal heart beats and so there was a brief irregularity in his electrocardiogram that showed up. The Air Force and, I presume, NASA were both somewhat concerned with, you know, was this an effect of space flight or wasn't it, and especially since the Air Force had this intelligence data and knew that the same thing had happened to Titov, or not the same thing, but a similar thing.

It was our impression, and I wasn't the only one on the Lovelace staff who was looking at the data, but as I looked at it and as others with me looked at it, we felt that the occasional premature heart beats on John Glenn's electrocardiogram were the sort of thing

that could happen to anybody and not related to space experience necessarily at all. As it turned out, that was the right—that's actually what happened.

I think that was also conditioned by the fact that one of the early monkey flights where the monkey in the Mercury spacecraft was elaborately wired up with telemetry data was the victim of a malfunction in the equipment. He was supposed to go through certain motions and if he did it right he'd get a reward, and if he did it wrong he'd get a shock. Well, he was getting a shock no matter what happens, no matter what he did, and he became very frantic and was tearing at the—trying to get himself out of his situation in which he was restrained. He developed some abnormal electrocardiograph tracings under that kind of stress.

Again, to the people who were familiar with physiology, this didn't come as any big mystery, it just was sort of what you'd expect, but it was a little hard to convince some of the politicians. It was not an omen. There was a scientific group who, for self-serving reasons, because they were involved in primate research, insisted that NASA should not be allowed to launch an astronaut into orbit without doing a series of some forty flights with primates first.

And that was the atmosphere that manned space flight proponents had to battle with all the time. It went a long ways towards giving the biomedical establishment a bad name, I think, with some of the flight operations people, because we all got tarred with the same feather—"These guys are all white-coat crazy scientists who are going to throw obstacles up in our path." I think part of our job was to try to convince them that it was good to have some crazy white-coat scientists on their side, and we were.

So anyway, that's all kind of background information. I came to work for NASA around the first of July in 1962, and the manned space flight program was just in the process of relocating from Langley Field, Virginia, to Houston at that same time. So I went through the business of processing as a new employee and civil servant, finding my way around

Houston at the same time. It was sort of like *Alice in Wonderland* to me. The city was growing. NASA was growing by leaps and bounds.

The people of Houston were very enthusiastic about the space program. There had been these three successful launches by that time. There'd been Grissom's accident, but fortunately he survived. John Glenn had his flight. [M.] Scott Carpenter had his flight somewhere in that period, not too long after John Glenn's. They all had parades and they all came to Houston and gave them the key to the city and cowboy hats. And we watched it on television in a motel while we were getting relocated to the city.

The office where I first went to work was in the Farnsworth Chambers Building. That was the name of the building, and it was the headquarters of the manned space flight organization up in south Houston close to—not very far from the Gulf Freeway and Griggs [phonetic] Road. Our designated office was right next door with a connecting doorway to the astronaut office in the building.

I arrived actually before Dr. Berry did, who was my boss, because he was coming from the East Coast and was tied up with other things. He was still active duty in the Air Force at the time and on assignment to NASA, as were most of the medical people in the program at that time. There were very few civilian employees in the medical field, just because there weren't that many around with training or expertise in aviation or space medicine.

But one of the first people I met, I was walking around in this office wondering how we'd convert it into a medical workplace because Farnsworth Chambers had been some sort of an architectural firm, I believe, or had something to do with that. It had racks on the walls for blueprints. The only person right next door in the astronaut office at that time was their secretary, Nancy Lowe, who very graciously took me in tow and introduced me to the astronauts as they came into work.

We got a girl from the secretarial pool whose name was Becky [Rebecca] Boozer and she became our secretary ultimately. So Becky and I sort of unpacked boxes and set up equipment until the boss got there, which was within a few days. Then he rapidly started to orient me.

This could be a specious recollection, but I've had it ever since I went to work for NASA, and I think it was probably an actual event. He took me over to visit and go through the Crew Systems Division, which was in the Engineering Development portion of NASA. Dr. Stan [Stanley C.] White was the chief of the division, and they had a responsibility for supervising the contracts for the environmental control systems for the spacecraft and for the pressure suits. Dr. White was one of the Air Force's leading authorities in pressure suit development. His deputy was Richard [H.] Johnston, Dick Johnston, who had worked as a civilian at a Navy research facility where they were doing pressure suit development for Navy flyers.

As we were walking around through the Lane Wells Building, which is where the Crew Systems Division was headquartered, it was a couple miles from our building, somebody called Dr. Berry on the phone and he came rushing from where he'd been, picked up the telephone, and he started talking on it. I looked down at the other end of the phone and there was a technician madly trying to screw in the wires to attach the phone. [Laughter] They were moving that fast at the time, and I thought this just typically characterizes the way this organization is going. He was able to talk on the phone, so apparently that was just the last connection to be made to make it work. We didn't have wireless phones at the time. Chuck was famous for ignoring details. He never realized that he was talking on a phone that was just almost not connected.

So that was the beginnings of the whole thing. I was trying to reconstruct the organization in response to an outline of questions that you gave me, and I remember that Howard [A.] Minners had been recruited and he was a Public Health Service career

physician. He joined us essentially from the very beginning, but I think he and others in the organization arrived after Dr. Berry did, if my recollections are correct.

Dick Pollard, Richard [A.] Pollard, was an Air Force flight surgeon who was detailed to the organization. There was a Navy senior medical officer, Dave Morris, David [P.] Morris, who was assigned to the medical operation support office, but was actually stationed at Cape Canaveral at the launch facility down there. So he was kind of our man in Florida who looked after the astronauts, continuing health protection when they were in training down at the Cape. And with Dr. Berry and myself, I think that was the whole original organization.

Dr. Berry reported to Walt [Walter C.] Williams, who was the associate administrator, and worked as kind of a right-hand arm for Bob Gilruth, the director at the same time. Their offices were just down the hall from us in the Farnsworth Chambers Building. So we were pretty handy if they wanted to yell at somebody.

BUTLER: Hopefully that didn't have to happen too often.

CATTERSON: It really didn't. We had a good working relationship. I don't remember exactly when Walt Williams left the organization, but he did within a short period of time, and was replaced. The organization was constantly changing. It was just part of the growth, I suppose, and expansion. But there were cynics who say, you know, when the government doesn't know what else to do, they reorganize. [Laughter] We had little slogans on the wall that said, "If the boss calls, get his name." That sort of thing.

BUTLER: There was certainly a lot that wasn't known at the time, and I guess that was part of the—

CATTERSON: Oh, it was very challenging, as I say, there were these folks who were saying, "You don't know what you're doing and somebody's going to get killed if you proceed," and, "How dare you have the effrontery to support this manned flight in the name of science?" Then there were others who said, "What's holding things up? Let's get on with it." The astronauts certainly had strong ideas about how the program should be structured, and they had a lot of clout in terms of the way things were structured, and I think probably reasonably so.

I joined in July, and the first flight that I had anything hands-on to do with was Walter [M.] Schirra's flight, which was in early October, actually launched October 3rd of that year, 1962, and Dr. Berry took me with him on the first trip that we made after we'd gotten ourselves squared away down to the Cape. He took me on a tour of mission control, which was there in Florida at the time, and said, "This is where you're going to work during the mission." Again, I was just blown away. I just walked in off the street, and here I am going to be at the Mission Control Center for the next flight, and was, as it turned out, monitoring the telemetry from Schirra's mission, which was the longest American manned flight at the time.

John Glenn and Scott Carpenter had each flown for three revolutions and back down, and only Schirra's flight was for six revolutions and down. There actually were some very minor little clues as to alterations in the circulatory physiology that occurred as a result of adaptation to weightlessness and then readaptation to gravity, to the force of gravity after reentry, and Schirra pointed them out. He was taking a shower and he looked down and his feet were purple, and he thought, "This is kind of strange." [Laughter] He brought it to the attention of the medical people afterwards, and it really was a pooling of blood in his feet because his circulatory system had gone through some short-term changes during his six orbits. And that became a focus of more research as time went on.

The next mission was [L.] Gordon Cooper's, which was almost twenty-four hours in orbit. That was also monitored from the control center down in Florida. We were joined by a friend of Chuck Berry's, who he had recruited to be his deputy in the Office of Manned Space, the medical office, medical operations office, Dr. D.O. [Owen] Coons, who was a Canadian Air Force flight surgeon. He and Dr. Berry had gone through their residency program in the Air Force together and taken their Public Health training at Harvard, so they became firm friends during that early phase of their training. Dr. Coons ultimately resigned from his Air Force commission and did come down and join the group as Dr. Berry's deputy.

The office began to expand fairly rapidly to meet needs of a growing organization. From that time on, we had ultimate responsibility for overseeing the medical selection process for the second class of astronauts who came in. There were nine of them and they included a number of the Apollo astronauts. Frank Borman and Jim [James A.] Lovell [Jr.] were in that group. Neil [A.] Armstrong was in the group. I believe [Edwin E.] "Buzz" Aldrin [Jr.] was in that second class as well. So folks who played a major role in the Apollo program were in the class.

The original Mercury 7 astronauts had all gone through the Lovelace Clinic, or Foundation, for their physical examinations and they were elaborate examinations that took many days to go through, because nobody knew what they were going to be up against. I think the philosophy was, well, let's find out as much as we can about their health status, and try to eliminate anybody with any significant impairment, and then baseline as much information as we can get and archive it, and then if space flight does draw some changes, we'll be able to detect them faster.

Dr. Schwichtenberg was always a forward-looking sort of a futurist, and he had developed what he thought was going to be something that NASA would embrace with enthusiasm. He got all the data from the selection physicals encoded on IBM mark sense [phonetic] cards for computerization, and the staff of doctors at the Lovelace Foundation

were brow-beaten into filling these mark sense [phonetic] cards out for each portion of the physical examination, and they ended up in a little deck of cards that an IBM machine could sort and print out, assuming that you had the program to do it.

But NASA didn't develop the program to do this, so they got the astronauts and they got this deck of cards for each one, which told them nothing. They got a summary and they got the firm assurance from Dr. Lovelace that everything was just fine, but not knowing what else to do, they sent these poor seven guys through a whole other physical examination performed by the Air Force at Wright-Patterson Air Force Base in Dayton, Ohio, and got an old-fashioned set of medical records that they could work with from there.

So I walk in, proud of my credentials, and said, "I've been at the Lovelace Clinic," and the astronauts said, "Oh, yeah." [Laughter] Many of them had pretty salty things to say about their experiences there, but at the same time they understood what had happened, so there wasn't a serious rift that occurred.

BUTLER: How were things done differently for the second group? There were changes in the tests that they were put through?

CATTERSON: Oh, yes. Well, yes, the changes were simplified. I mean, the tests were simplified to some extent. Not a whole lot. I mean, there were some things that were done, and there were other people who coined the same term, but Frank Borman had a good expression to characterize some of the medical studies and he classified them as "gee whiz research," because you'd do the study and you'd stand back and look at the results and say, "Well, gee whiz." It had nothing to do necessarily with what you were trying to find out or what you needed to know.

One of the devices that they had to put up with up at Wright-Patterson was a three-dimensional spinning device that would disorient anybody in about thirty seconds, and the

end point was you get sick and throw up, motion sickness. It really didn't have a lot of relevance to anything, as it turned out, but the theory was that you could sort people by their resistance to motion sickness on this device, and I suppose you could to some extent. So those kinds of things weren't done in the selection process in the second group of astronauts.

We developed a contract, actually, with the Air Force School of Aviation Medicine, which by then had moved from [Randolph] to Brooks Air Force Base in San Antonio, and so they did the physical examinations. We stipulated what things we thought needed to be done, and it was a give-and-take type of mutual negotiation, but NASA did have the final say as to what they thought was essential. There were a couple of times when the Air Force folks were bumping heads with Dr. Berry, and [Robert R.] Bob Gilruth and Walt Williams would be very supportive and never did they back away. They just said, "No, if that's what our doctors say should be done, then that's what we're going to do," and that's the way it was.

The Air Force had still not graciously conceded that the space program, the manned space program, was going to be run by a civilian agency. There was a lot of inter-service bickering that was going on, and there were some overt attempts to just kind of shove the civilian people aside and exert the military's—I mean, it was on their turf, so it was kind of understandable, but it just didn't happen.

Dr. Berry was very tenacious about protecting what he considered to be the need for NASA to do its own thing. If he even suspected that this was going on, why, he'd mount a furious counterattack. I suffered through some of those. Just kind of thinking, do we really have to do all this? They just wanted to be there and watch. [Laughter] But in retrospect, as I've gotten more canny about the political process, I think that it was necessary to be aggressive, or there wouldn't have been any civilian independent component.

But the Air Force did the physicals and submitted the results to us as a written report, mark sense [phonetic] cards. Then we would go through the physical examinations and categorize the astronauts into categories based on what we thought were going to be useful to

the people who had the ultimate responsibility for their selection in flight operations, engineering departments in NASA, as folks who were medically acceptable without question, you know, there was just nothing wrong. Everything that we tested was okay.

There are folks who had some medical flaws, but still seemed to be the sorts of things that wouldn't interfere with their ability to perform their jobs, in what we understood their jobs to be as astronauts, granting that anything was possible. But we thought we had a reasonably good handle on what was likely at that stage of the game.

Then there was sort of a "C group" who had some medical problems that we thought if they really needed them because of their other skills or because of other qualities they had as astronauts, we could probably live with, but we thought that they ought to look long and hard at somebody else if the astronaut fell in that category, or if the candidate fell in that category. Then there was the group that we didn't really feel comfortable accepting because of some serious medical problems. And that seemed to work pretty well. It was an individual examination by examination review of all the results.

You had asked me in all the questions that you sent as to how my experience with NASA differed from the Air Force experience. This was clearly one of the great differences, because in the Air Force things were so structured that there was a manual for everything. How to put on your necktie was clearly spelled out with regulations. And what constituted fitness for flying was certainly codified in Air Force regulations and in Strategic Air Command regulations, which in some cases were more restrictive than they were for the rest of the Air Force at that time in history.

So you went from this, all you had to do was to know where the library was to do your job, to where we were literally making up the rules as we went along. It was humbling. It made you really stop and think about what are we doing here, and if we make the wrong recommendation, a lot could happen that could be disastrous.

But as I look back on it, and I think this is true, we never really felt that we were in that much of an uncomfortable cutting-edge situation. It just seemed that everything was working well and that there wasn't any reason that it couldn't continue working well as long as the environment was suitable for life support for the astronauts. We worked hard to define that.

BUTLER: I guess by that time you knew, at least, some of what space flight effects would be on the—

CATTERSON: Yes. I probably had more information about what had happened with the Russian program than anybody else in the group because of the Lovelace's experience, because the Russians certainly weren't going to tell anybody anything that happened. Everything was perfect as far as their—the Cold War was fairly intense at the time. It was many, many years before there was any exchange of information between the Russian space scientists and the American from those days. But we did feel that we had sound reason for going ahead.

During Walter Schirra's flight, the Mercury temperature control system was—well, the spacecraft got quite warm. Wally Schirra was a very meticulous and careful and methodical engineer and pilot, and he didn't want to twist the thermostat, the temperature control, rapidly to cool the thing down too fast, because he was afraid that the heat exchangers would freeze up and become inoperable. He knew the systems very well. So he was just turning it down a little bit at a time, and waiting twenty minutes or so to see what happened to the temperature, and then turning it down a little bit a more, and waiting another twenty minutes or so.

CATTERSON: The temperature exceeded the mission rule that had been documented before the flight took off, which meant that the flight director should abort the mission and should end it prematurely, according to the flight rules that were written, and the engineer responsible for environmental controls was recommending that the flight be terminated. Chris [Christopher C.] Kraft turned to the medical people and said, "What do you think?" The capsule communicator representing the astronauts was saying, "He's fine. Let him do his job. He's just doing what he needs to do."

We said, well, based on his heart rate and based on the respiratory rate and based on his core temperature, which we were taking then, there was no sign of a problem, and we thought it was perfectly reasonable to disregard the rule and to keep on going with the flight. They did, and, of course, the temperature ultimately did come down and it got back in the range that they wanted it to and everybody was happy.

The astronaut capsule communicator [capcom], for the first time, acknowledged that there was some advantage to having a flight surgeon in mission control at the same time, because that mission would have ended if we hadn't have been there, prematurely. And that was kind of my first experience with making what I felt was a tangible contribution to the program, something you could kind of stick on your guidon and wave it with the breeze when you had to resist a cavalry charge from the other direction.

BUTLER: Looking at this situation and talking about your contribution as a flight surgeon to the mission and the Capcom's response, how were your relations with the astronauts, especially early on as we're talking about Mercury here, and did that change as the programs went on?

CATTERSON: Yes, not drastically, but it changed. I think it changed more as a function of the personalities of the people than as any big insight into the validity or lack of validity of the

various roles. In the Air Force, pilots are notoriously nervous about the flight surgeon's role, and to my surprise, and it still surprises me even forty-odd years later, airline pilots, professional pilots, still have that same anxiety about having to take a flight physical and pass a prescribed medical examination every six months, which is the rule for airline pilots. It's all sort of mystically wrapped up in the psyche, I think, of the human animal.

Pilots and doctors have one trait in common, and that's that both are considered control freaks. They feel the need to be in control of a situation, whatever it may be. That's good, particularly for the pilots, I think. When they have to take this physical examination, they feel that there's nothing they can do, it's out of their hands, and this man sitting in the white coat across the desk, or woman, has it in his power to end their career, and they walk into the office with that thought just sort of out there in a very conscience level of their awareness. It causes a lot of problems with high blood pressure and rapid heart rate and things that we have to kind of take into account and make allowances for, without at the same time missing somebody who really has a blood pressure problem that needs to be treated for it.

So that sort of prickly relationship very much existed between the pilots and the flight surgeons when I was in the Air Force. They liked having a flight surgeon that they could turn to for help when they needed it, but they didn't like that aspect that the flight surgeon had this power, which didn't have anything to do with their skills as a pilot, to say that they weren't fit to fly anymore. It was hardly every used. The reality is that in the years that I've been associated with flight medicine, I could probably count on my ten fingers the number of folks that I have had to ground for medical reasons. It's a natural selection sort of a process and it doesn't happen that often.

It happened with two of the Mercury astronauts out of seven, which was certainly above average, and something that no one could have predicted. But Alan Shepard developed Meniere's disease, which had nothing to do with his flying, as far as we know. It's

a condition that still isn't that well understood scientifically, so I can't say that maybe something associated with his career as a test pilot had something to do with the cause of the disease, but the fact that he flew that suborbital flight in the Redstone and Mercury spacecraft didn't have anything to do with it, I'm certain of that. But he wasn't able to fly until the disease process no longer was a problem, and then fortunately he did get to do an Apollo flight.

[Donald K.] Deke Slayton had the same experience. He was grounded for medical reasons while I still at the Lovelace Foundation. As a matter of fact, [William K.] Bill Douglas brought Deke Slayton out to Lovelace to see if he couldn't get a medical opinion from the people there who had done the original astronaut selection that would overturn the conventional wisdom that said that his heart condition made it unwise to let him make a space flight. Unfortunately, he got the same answer from the folks at Lovelace.

It was interesting, because I was able to sit and listen to the conversations and the heart specialists, the chief of cardiology service, and Dr. Luft, a pulmonary physiology expert and probably the most knowledgeable aerospace medical man in the United States at that time in terms of what the body could withstand and what it couldn't withstand, were in accord that common sense and reason said he'd probably be fine if he just went ahead and went with it.

He had this paroxysmal, or spontaneous and unpredictable quirk of his heart taking off and beating in an abnormal rhythm. But he'd had it for—nobody knew when it started, because it was discovered while he was in the program, because they did so much monitoring of electrocardiograms and saw it on the tracing. He'd lived with it, he'd probably flown with it just fine when it wasn't known, and he could probably fly with it in a spacecraft just fine, but if asked to sign their name and put their professional credentials on the line in saying that "In my professional opinion this is a safe thing to do, no way, because I just don't know." That was a dilemma that Deke Slayton had to live with.

Dr. Berry had also some experience hauling him to—he probably saw just about every cardiologist with any notoriety or any reputation in the United States. One of the reasons Dr. Berry was delayed getting to the job was that he was with Deke Slayton visiting Paul Dudley White, who was a famous cardiologist up in Harvard in Boston, and they had the same experience.

Anyway, eventually Deke's problem disappeared and he was able to cap his career with space flight in the Russian rendezvous with an Apollo spacecraft. I was glad that they both happened.

It fell my lot when Al Shepard's Meniere's disease was diagnosed and became known and we couldn't any longer pretend it was something else. Dr. Berry was out of town, so I got the pleasure of confronting Al Shepard and saying, "You're medically grounded, compadre. This is the way it is." Being a very professional person, he took it very stoically and didn't say any more about it. But one of my goals was to sort of be around if he was ever able to fly in space, and so I made a decision to leave NASA and go on and do something else, but I didn't make my resignation effective until after his Apollo 14 flight. I don't think he knew that, but I just sort of felt I want to be there when he flies again, since I was the guy that had to put on the black hat and tell him that he couldn't fly anymore.

BUTLER: That must have been very rewarding and special for you to be able to—

CATTERSON: It was, it was gratifying. Not that we had anything to do with his getting better, although we certainly did help research what was going on in the field of the ear, nose and throat physiology and inner-ear physiology. I don't know who exactly it was that tipped him off to the existence of a specialist out in California who was eventually able to give him a solution to his problem through surgery, but he knew that we were on his side in terms of doing that, him getting it done.

BUTLER: Certainly a very unique relationship, as you said, that as a flight surgeon you are concerned about the astronauts and their health and want to help them do their job, but yet also you do have to be concerned about, well, can they make this flight.

CATTERSON: The nature of the job was to be objective and to retain some objectivity about the job, and I think the good flight surgeons do that, but they always see their job as being one of protecting a pilot's career by being proactive and by helping recognize and deal with little problems before they get to be career-stopping problems. Over the years, the astronauts recognized that that was the role that we were playing, and so we enjoyed their respect, but they didn't necessarily want to room with us when we were on travel, for legitimate reasons, I suspect. [Laughter]

BUTLER: Certainly. Well, we've talked a little bit about the Mercury program and some of the missions you were involved with and some of the early missions before you had come to NASA. Before you actually came to NASA was when [John F.] Kennedy made the challenge to go to the Moon by the end of the decade. Did you recall hearing that challenge at that time, or did you just gradually become aware of it as you became involved in the program?

CATTERSON: Well, I heard at the time. It's not one of those things where I can remember where I was and what I was doing when he made the speech, but I was aware of it. It was tremendously exciting to me, because I thought, ah, now we're really off and going. We've got a goal that is going to make this whole thing really work. So I was very enthusiastic about it. The key moves that our national leaders made, when Eisenhower decided that the military services were so interested in knifing each other in the back that we were never

going to get anywhere in space, and he set up the space program as an independent agency, I thought that was a brilliant stroke. So I was watching and avidly interested in what was going on at the national level as those things happened. Certainly Kennedy throwing down the gauntlet and saying a man on the Moon came as a big surprise to me, because I didn't think anybody would have the guts to suggest such a thing.

BUTLER: Were there any, on your part or even just in the medical community, or even through the NASA medical community, any thoughts that came to mind medically about making such a goal in that time frame? Any things that you were particularly concerned about or wanted to watch for?

CATTERSON: I think we—well, we wanted to watch everything, and really wanted to be sure that we didn't miss any straws in the wind that were indicative of what could be serious problems. We wanted to be sure that we had appropriate tools to do our job as the program went along. Again, I can only speak for the folks that I associated with day in and day out, and we were always optimistic about it and felt that this was achievable, that the man would be okay if the hardware was up to the job. But we also recognized that that was an assumption on our part and had to be validated by careful attention to facts as we went along.

The astronauts were—well, not only the astronauts, but a lot of the engineers, they felt handicapped by the telemetry bandwidth that biomedical data occupied because getting it down from a spacecraft did take a lot of bandwidth, a lot of energy that they could have used for other scientific goals and engineering purposes. So there was constant pressure on us to knock it off. "We've done this now and everything's okay up to now, so haven't we proved what we need to know and can't we just quit?" That existed right up through the Apollo program.

After the disastrous Apollo fire, when they were reengineering the spacecraft and considering all of the things that should be changed, there was a very strong movement to discontinue the telemetry, medical telemetry, and things weren't really going very well. We were sitting in a senior management meeting that George [M.] Low, over which he was presiding, and he was the director of the Apollo program at Houston at the time, and I was watching, reading his face as the meeting went along. Frank Borman had been selected to troubleshoot a lot of the astronaut-related exchanges that needed to be made, and he had been presenting those.

A series of scientists and engineers had gotten up and said, "If we can just stop this foolish telemetry, we can get rid of a hazard and a nuisance, and it will make the program safer and it will make our lives a whole lot simpler."

I don't remember who actually was responsible for defending the program, but it was somebody from Engineering and Development. What they said was accurate, but it wasn't very persuasive. I was sitting there just sort of in attendance, and I couldn't stand it anymore, and I asked George if I could speak to the issue. Among the things I cited there came to mind was this experience we had in the Mercury program, and there was a similar experience at one point on the Gemini program, where without the medical telemetry, the mission would have had to have been aborted, and the astronauts and everybody in the room knew that. By relating those and saying that, well, we felt in all probability things would be just fine, we also felt the need to have the data and that we weren't ready to say that we knew that they were going to be fine just yet.

He made the decision that they would redesign the telemetry and make it less obnoxious than it was, or make it safer, and incapable of contributing to sparks or fires, which it hadn't done up to them, but there was reason to be concerned that it might.

In a break in the meeting, he got up and he came over to me and he said, "You just saved the whole telemetry program, because I was going to turn it off until you reminded me

what was there." So once again, this was one of those days when you think, yeah, I'm glad I was here today.

BUTLER: Absolutely. It was certainly something very important and obviously did continue to come into play in the Apollo program that was very—

CATTERSON: Yes, because we had to resort to extrapolation of data in the Apollo program, because the only concern we really had, I mean, there were concerns aplenty about what could go wrong, but the greatest threat to the extravehicular operations was that the astronauts would get overheated and would suffer from heat exhaustion, and we didn't have any direct way of measuring this, or of assessing it. But by assessing heart rate and respiratory rate and the temperature of the spacesuit, which we did know, we developed a sort of a little safety chart that we used.

We explained to the engineers that we were looking at the metabolic rate of the astronauts indirectly, and that as long as it was within known acceptable limits, it was okay for them to keep on doing what they were doing. If it started to shoot off the top of the graph, we'd have to insist that they slow down and rest and take it easy. There were times when we did have to say, "Just back off a little bit, or you're going to get to the point where you aren't going to have the stamina to get back to the lunar module." So it was effective and it was very welcomed during the lunar phase of the Apollo program.

BUTLER: Certainly there were mentions of a lot of times when the astronauts would be, of course, trying to achieve the objectives that had been set, but would come across the various difficulties where things were harder than expected and would overexert.

CATTERSON: It was all part of the learning of how to do things in the weightless environment that there just weren't any manuals for.

BUTLER: Certainly a critical thing to keep in mind for the whole program.

Looking at the program, and we've worked through Mercury and moving into Gemini, began to move into longer-duration missions, move into the extravehicular activities and getting into more experimentation, too, during the missions and more testing, were you involved in any of the discussions about the—be it the length of the space flight, and then what they would do on the missions?

CATTERSON: Yes, I certainly was. There was an Office of Space Medicine in the manned space flight organization in NASA headquarters in Washington that really had the lead responsibility for developing the medical research program. It became a part of the Gemini missions. There was an elaborate program, a protocol set up for incorporating the medical research into the flight line of the program, the things that the astronauts were expecting to do when they got up there.

Dr. Sherman Vinograd was a medical doctor who came from academia and assembled a group of life scientists and biomedical research authorities who developed these proposals for research activities for the astronauts to do. They tried very hard—there was a group of twelve or fifteen scientists, as I recall, and they tried very hard to take a real-world approach and to put priorities on the studies that they thought would lead most directly to better understanding of the questions that we needed the most to know about.

For example, the fact that calcium was being cast off rapidly from the skeletal system and from the body during weightless flight or during microgravity flight is the politically correct term now, became known pretty early on. A very important question was, does this

reach an end point or does it keep on going to the point where their skeletons will just have no tensile strength when they get where they're trying to go, for example, to Mars.

So they devised Gemini experiments that were intended to really understand the metabolic—what happened to the calcium in the body, what happened to what they ate, where did it go. This involved collecting urine, collecting feces, very carefully measuring the calcium in every morsel that they ate, collecting sweat. On the flight that Frank Borman and Jim Lovell did for two weeks, they made enormous efforts to comply with this very elaborate program and to get all the information back that could be gotten back.

It turned out to be overly ambitious and data were not as tight as the scientists would have liked it to be, but certainly through no fault of theirs. They even had to know how much calcium was involved in the toothpaste that they used when they brushed their teeth. It was just amazing to see. The role of those of us in the medical operations side was to provide counsel to the research people as to what was possible and what wasn't possible and where their experimental designs might become so intrusive that they just didn't make sense. And I think we had a very constructive interaction during that time.

It began even earlier in the Mercury program, there were people that were trying to get their own research done by the astronauts, and sometimes the only apparent reason was that this would guarantee that they could get published, if what they wanted to study was somehow done in space. We got sort of a bad reputation as hobby killers sometimes just by saying, "Come on, now, you know, what's this have to do with anything?" If they didn't have a good answer, why, the manager could make up his mind in a hurry.

But in the Gemini program, it became a very spelled-out part and they would actually go through simulations where they simulated the performance of these medical experiments. These had to be weighed in terms of importance and assigned priority alongside of the other scientific studies that were done in the program. That reached its zenith, I think, in the Gemini program, and then again, no doubt, in the Skylab program, which was originally

represented as being just one for biomedical studies, but obviously never could be that one-sided.

During the Apollo program, the emphasis was on the operational aspects, and about the only science that was really seriously attempted was geology, collecting the specimens and getting the representative geologic rocks that the folks who were experts in that field wanted to study. Our job was just to make sure that the welfare and the health of the astronauts was protected during the missions.

BUTLER: Certainly always important. Looking at Gemini, and since that was a big medical focus, first they began stepping up the Gemini missions in length, and there's some discussion in the research that that was done on advice of the medical operations people that by looking at it in increments would help, instead of jumping to an immediate long-duration one. Was there any—I guess if you could tell us about any of those discussions that you were involved in.

CATTERSON: Well, it was a controversial thesis. As far as I know, it was Dr. Berry's invention, but I can't swear to that, it's just that he's the only one I remember coming up with it. It probably had its beginnings because operationally the missions tended to get twice as long as the previous mission. Schirra's space orbits took about twelve hours to complete, and then Gordon Cooper was up for twenty-four hours and we saw some changes, but we had time to digest and understand it.

So somewhere out of that experience he came up with the recommendation to the world at large that if we grew cautiously and if we didn't reach too far too fast, we could understand what was happening and we could sort of take any necessary corrective actions to make the next step feasible. We adopted the notion that if you doubled the exposure with each successive mission, as long as things were understandable and as long as we thought we

knew what the last mission meant and what the last exposure meant, we'd be okay. That if they could go for two weeks, if they successfully went for one week in Gemini, it was okay as far as the human physiology was concerned to go for two weeks. If they were okay after two weeks, it would probably be okay to go for four weeks and so on.

This was a tremendously controversial thesis, because many scientists just sort of said, "Where do you get off with this? You just pull this out of thin air. There are no proven experiments that indicate that this makes any sense at all." We said, "Well, if you've got a better idea." [Laughter] And really didn't try to defend it as being scientifically sound, but just sort of appealing to a sense of proportion. It has worked out, although nobody exactly adhered to that, it did exist in the Gemini program. They went from one week to two weeks, and two weeks is about as long as anybody could stand.

There were initiatives to fly Gemini to the Moon, but it was decided not to take that risk. Little things popped up along the way that we hadn't expected, like the decision to do an extravehicular excursion in the Gemini program came out of an attempt to regain some enthusiasm on the part of Congress and the national establishment after the Russians had done extravehicular activity. George Low said, "Well, I think we can do that," but it was kept very much a secret right up until it actually was done.

BUTLER: Were there any specific concerns medically about doing an EVA at that point, or just the same general type of concerns?

CATTERSON: The basic concern was whether the extravehicular astronaut would be so disoriented that he would really have problems and might get sick physically, and was he going to be able to get out and get back into the spacecraft and was he going to be able to maneuver out there. Again, it sort of came down to if worse came to worst, he was on a tether and he could sort of hand-over-hand haul himself back with that. But Ed [Edward H.]

White [II] used this little jet apparatus that was hand-held to maneuver himself, and it worked, but it had certainly a lot of instability associated with it. But I think it did provide enough information that it contributed to the development of so-called Manned Maneuvering Units that were backpack types of things that later astronauts strapped on and flew with and worked with, and, I guess, will work with again in the assembly of the Space Station.

The preparation for that was done using the altitude chambers at the Johnson Space Flight Center, and practicing egress from the Gemini spacecraft and practicing the extravehicular activities was all done in the middle of the night. I did monitor some of those altitude chamber operations, as well as medical officers who reviewed them, so I was aware that this was a proposed part of the mission. I had serious misgivings. I thought we were really sticking Ed White's neck on the line at that time, but it went pretty well.

BUTLER: Fortunately it did all work out. Of course, on later missions they did have some very severe difficulties with overexertion.

CATTERSON: Yes, they did. Yes, they had difficulties, too. They had a terrible time getting the hatch closed and sealed after his extravehicular operation. He stayed out there longer than mission control people wanted him to, because he was just almost euphoric about the whole thing. So everybody was sort of saying, "Ed, get back inside and shut the door," and he was saying, "Well, just let me stay out another five minutes, Mom." [Laughter] But he did, but it took every gram of strength they had to get the door closed and secured. The spacecraft hadn't been designed to do that.

Again we learned things about the difficulties of working in a pressurized suit and in a small cramped confined space, that fortunately the people who did it were able to come back and tell about. But it could have easily gone the other way. It was nip and tuck.

BUTLER: After the missions, in cases like this with the EVA and the various difficulties experienced, both with Ed White and closing the hatch, and later, how closely did you work with the astronauts and the designers and the mission planners to try and overcome these difficulties?

CATTERSON: Well, the astronauts worked very, very intimately with the folks who were responsible for the environmental systems, the suits and their design. Our role was really to find out what their medical status was as quickly as possible and before anything was forgotten or lost when they got back. So again, as the program evolved and as we all learned, the mission after recovery went on and a time line was designed before the fact based on what had happened previously that said exactly when the astronaut was going to do what.

Some of the first things that were done were drawing blood for the chemistry studies that needed to be done and making the physiologic measurements, doing a medical examination as soon as the astronaut got back on board the ship. That was under way and it was understood that that would be done. The only thing that ever interfered with it was the famous presidential phone calls that would always come whenever the President felt like making a phone call. We all just sort of had to say, "Oh, well, next time we'll get this blood pressure done on schedule."

BUTLER: Always have to answer to the President.

CATTERSON: Oh, yes. And I guess that was an important part of keeping the program going, certainly. I can't say it wasn't important. It can be inconvenient.

BUTLER: I think we'll go ahead and take a quick break here and change out our tape.

We've been talking about some of the Gemini missions, and you had mentioned before that in Mercury you worked in mission control for Wally Schirra's flight. During the Gemini missions, did you also work in the control room or did you just follow the missions?

CATTERSON: No, I did work in the control center alternately. We had an arrangement that was more or less informal during the Gemini program where either I or one of my colleagues would work at the Cape and it was then designated as Cape Kennedy, to supervise and orchestrate the pre-flight physical examination of the astronauts and to provide the medical support for their getting ready and be there through launch. This involved sort of riding along in the trailer when they went to the launch pad, or in the van, and seeing them off, and then going back and watching the whole thing on television at some remote location, and then flying back to Houston after that mission was launched.

Then the next mission, if I had been to the Cape for the previous one, I would stay in Houston and work in mission control, and at that time I would take one of the shifts as the surgeon at the console, the doctor console in the mission control center. Mine was always the evening shift, swing shift, which entailed having to go to the press conference that was usually about eleven o'clock at night when we would change, when we'd go meet the press and brief them on how the mission was going. So those were interesting times.

BUTLER: Very interesting. Certainly a lot of interesting things going on with the missions then.

CATTERSON: Well, there were, yes. As I say, there was one occasion when there was smoke or fumes in the cockpit from an unknown source, and there were a few moments of indecisiveness about whether this was going to call for an emergency abort. It all worked out okay, but I kept prompting the flight director to suggest to the crew that they ought to button

up inside their suits and close the visors and go on 100 percent oxygen, which would have not necessarily given them the best visibility, but made sure until they knew what the fumes were that they weren't going to be breathing something that was lethal.

He later made the remark that all the advice he kept getting was a little repeated announcement kept coming over the intercom loop, "Tell them to close the suits, flight." About the third time around, he did. Again, it was one of those times when you felt like you probably earned your pay that day by being there, because the suit experts were completely preoccupied with trying to understand where the fumes were coming from, because they also had the whole environmental control system, and they were busy looking at charts and graphs and possibilities. I didn't have anything better to do than to worry about what the guys were doing up there.

BUTLER: That's certainly something very good to be doing.

CATTERSON: Well, I thought so.

BUTLER: I'm sure they did, too. I'm sure they did.

As the program grew and you talked a little bit before about the organization growing and expanding and changing things around, different people in different positions and so forth, were there any, throughout the Gemini program and then moving into the Apollo program, any major changes that influenced the way anything really was done on a day-to-day basis for you?

CATTERSON: No. Pretty much the day-to-day activities, because we were so focused on from mission to mission, they stayed the same regardless of what the title was for the week. At some time, which I think was probably after the Apollo program was under way, the

center was reorganized and all of the medical activities were put in the Medical Research [and] Operations Directorate. So that we went from a staff office reporting to the operational people, to a line-responsible directorate in the organizational structure. The peer directors were the Director of Engineering and Development, the Director of whatever, were not life sciences. I forget how they characterized that, physical sciences, probably, the Director of Flight Operations, who was Chris Kraft, and the Director of Flight Crew Operations, who was Deke Slayton.

The Crew Systems Division was transferred into that directorate, so they were all working for the same boss at the time and there was better delineated responsibility and less room for shin-kicking and trying to pin the blame on the other guy after that change was made. But, again, it didn't really materially change the day-to-day activities that we did.

BUTLER: I'm sure there's not a typical day, but if you could walk us through what, as a flight surgeon, you would do on a semi-daily basis, or pertaining obviously in the missions you were in the control room and so forth.

CATTERSON: Yes. The mission phase was almost a different job from the between-the-mission phase. Between missions we were concerned with—well, into sort of final organizational phase, reviewing tracking, how we were going in terms of meeting the defined program goals, staying on the budget, seeing what the folks in the research side of the house were doing, and an endless series of meetings that we were always required to be in attendance at, which took up great gobs of time. I think that while they were necessary, they were viewed as a necessary evil, too, that we could be more productive if we could be out doing something that was more related to our job instead of trying to define our job as it related to the big picture at one of these meetings, but that was our life.

I would go into work every morning without the faintest idea of how I was going to spend my time that day. It would just sort of happen after I got there. Having a preconceived schedule is just a waste of energy and time, because it never really was kept, with the exception being during the missions, where everything fell in by the numbers and lockstep and you were doing what you had expected to do day after day. Those were probably the most fun part of the whole job.

I was never really enthusiastic about little models of bureaucracy, but I began to really become a firm believer in the Peter Principle. As I kept getting promoted, one day I looked around and thought, "What am I doing here? This has so little to do with what I went to medical school for. Maybe it's time to reconsider my life's plan."

I was walking to lunch with one of the engineers one day and we had just been in a very heated argument about the proper priorities of some of the medical studies for a mission, and I don't even know which vehicle, I suppose, whether it was Gemini or perhaps one of the early discussions about Skylab. But I was frustrated and I had just sort of made the comment as we were walking along, "I wonder if Albert Schweitzer started this way?" And my scientist colleague said, "Who's Albert Schweitzer?" I thought, "Now I know I'm in the wrong place." [Laughter]

The job did change, not because what the medical folks did from day to day changed, but my responsibilities evolved from the early days when it was seeing the astronauts day after day and looking after their health needs, and even making house calls for their kids in the early days of the program, which was certainly a spillover from our Air Force experience.

I sort of gradually became the Philadelphia lawyer for the organization, whose job it was to defend the budget and explain the program to folks in meetings and explain why we're doing what we're doing, and stave off the hoards of Huns who were trying to storm the ramparts and take us out of existence. That got to be kind of like *déjà vu*. You'd get one generation of vehicle designers and builders convinced that you belonged in their group, and

then the next program would come along, whether it was Apollo or whether it was Skylab or whether it was the Space Station Task Force, and it'd be the same thing: "Well, you know, we've solved all the medical problems, so we don't need you guys here." Then you'd have to sort of go back to Space Medicine 101 and say, "No, you really do need us because—" I really began to feel that I was experiencing burnout toward the end of ten years there, nine years.

BUTLER: It certainly was a very intense time.

CATTERSON: Well, you know, sometimes it got too intense. I mean, I would get overwrought and go into tantrums in some of the meetings. I remember Chris Kraft, as we broke for coffee one day from one of the management meetings when I had really felt that we were being betrayed, he said, "Duane, you've got to relax. You're going to give yourself an ulcer if you keep doing this." [Laughter] He was very fond at throwing little remarks at the medical people, just sort of his way of reminding me that I should probably take some of my own medicine. [Laughter]

BUTLER: Helping look after your medical well-being.

CATTERSON: Well, he was. Yes, he was.

BUTLER: You moved into a lot of these more management-oriented roles during the Apollo missions, is that correct?

CATTERSON: Yes, yes, at somewhere along the way there, and it was in the Apollo program, it was after George Low changed hats from being the Deputy Director of the center to being

the full-time manager of the Apollo [Spacecraft] Program Office, that I was officially appointed as the deputy director to Dr. Berry. So I had responsibility for overseeing the program when he was out of town, or just kind of covering his back, whether he was in or out of town, and try to keep the program going. We said that one of the responsibilities more or less was that I was the inside guy who looked after the mundane day-to-day operations and he looked after the big picture of the program and defended us at congressional hearings up in Washington. I was glad to let him do that.

BUTLER: As the inside man and as the Apollo missions were progressing, what was your involvement specifically with the missions? Did you still do any work anytime in the control room, or did you just follow them?

CATTERSON: Mostly I simply followed them. I voluntarily stopped taking a regular shift in the control room, because there were just so many things that needed to be attended to for the rest of the program, so that I would stay over in the headquarters building and follow the mission. From time to time, I did take some shift work in the support room, which was one of the back rooms where the telemetry data came in raw and was digested, and there were people in these back rooms in all the various specialty areas who could keep the surgeon in the control room advised of things that might be missed otherwise. So that was kind of interesting work, but I could do that for a couple of hours and then go out and do something else. So it wasn't anywhere near as intense.

I don't honestly remember whether I ever worked shift work for Apollo manned missions in the control center, but to the best of my recollection, I never did.

BUTLER: Especially on the early Apollo missions, there were a couple of instances where medical issues would come up, for example on Apollo 7, when the astronauts caught cold,

and Apollo 8 and 9 where Borman and [Russell L.] Schweickart both experienced pretty intense illness. At that point were you called in for discussions or do you recall how any of that worked?

CATTERSON: Yes. Yes, especially if there was a move to replace a crew member during the late phases of the training program, that was a very unwelcome event, if it happened. During the mission itself, if there was a question of illness, nobody made a stat decision as to what to do. It was reviewed and discussed, and I was usually involved in the discussion, to listen, to make suggestions if there were any sensible suggestions to make. With the cold things, why, we just sort of felt that, again, you'd have to use the good common sense of the astronauts themselves to advise us.

They did set up a confidential communications voice line where the pilot or any astronaut could talk directly to the doctor on the ground without going through a public affairs accessible loop. If he wanted to say something that he didn't want the whole world to know, the security was better that it would happen. It wasn't still guaranteed that it wouldn't show up on the six o'clock news, but there was a better chance. That was a great source of strength, the fact that a doctor could provide advice over a voice loop directly and talk to the astronaut and get his first-hand account of what was going on.

Again, I was never the doctor who was doing the talking under those circumstances, but I was involved in a lot of the preparation for those. When the famous decision to make a crew change because of the exposure of Jim Lovell's crewmate to three-day measles occurred, why, Bob Gilruth and George Low asked me to come in and talk to them about this in his office. Chuck was out of town somewhere. They wanted some reassurance that this was the responsible thing to do or that maybe we didn't have to do it after all. That was sort of the nature of the discussion.

Fortunately, I had been briefed on what everybody was saying about the issue. It was one of those things that made such little sense on the face of it, why in the world would you make a big issue about the three-day measles, it hardly ever makes anybody sick anyway. But once again, when we turned to the foremost experts in the field of viral illnesses, they painted a whole different picture, and it was a pretty bleak picture about the complications that can occur and do occur in some percentage of cases, folks who get rubella, and that good prudent sense dictated not putting somebody who might come down with the disease, the active disease, right in the middle of the mission on the way to the Moon at that exposure.

I remember Dr. Gilruth sort of shook his head as I outlined what I had been told, and he said, "This is one of those things when we've got more knowledge than we know how to deal with." It was a very sage statement. As it turned out, he could have flown the trip, would have been fine, but it might have been a less successful outcome if he hadn't have been there to troubleshoot, how to jury-rig the system to provide a survivable condition for the crew when their oxygen tank blew up.

BUTLER: When the accident did occur, so many people came in and were here at the center twenty-four hours a day working on the problem. Did you also come in? Of course, there was only so much you could do from a medical standpoint.

CATTERSON: Yes, there was very little we could do from a medical standpoint. No, I pretty much kept regular hours during that time. I was over at the control center several times, sort of keeping touch with what was going on. I probably talked to Dr. Berry at least once an hour while that was happening. But the solutions to the problem just really impressed me with the power of human ingenuity, when everybody gets together and really goes all out. But they came out of resources that we didn't have anything directly to do with, so probably the biggest job that the medical people at that whole juncture was to monitor the

environment, to make suggestions about how the crew could conserve energy and conserve heat and do their best to keep them healthy.

I don't think that Dr. Berry, or the other people that were on duty at the Mission Control Center, had an awareness until after the flight as to how sick [Fred W. Haise] was at that time. There was an awareness, but he landed a real sick individual, with a high fever. That was pretty much a surprise when he popped out of the spacecraft.

BUTLER: I guess that's when you all were able to come together and help him on that.

CATTERSON: Well, yes, once you got a patient—one of the really inspiring things about my whole experience working as a doctor at NASA was that the country's resources were literally at our disposal and I could pick up the phone and I could talk to anybody anywhere in the world who had something to contribute, and they would drop whatever they were doing and make themselves available to be helpful.

BUTLER: That's great.

CATTERSON: It was really impressive.

BUTLER: It's nice to have that kind of support.

CATTERSON: It really was. I mean, it was hard for me to believe, with that sort of thing going on, the politicians' assertions that the American people no longer were behind the space program, that they weren't interested in it anymore, I think that the folks who were allocating money to pork barrel projects weren't interested in it anymore, but I don't think the

American people ever lost interest in the space program. It was something that was inspirational.

BUTLER: Certainly there's a lot of excitement to it, and obviously still going on today.

CATTERSON: Yes. I hope the Space Station keeps on staying close to course, that they don't encounter any huge setbacks, because I think that will again kindle enthusiasm about furthering our exploration of space.

BUTLER: Absolutely. One of the issues in the Apollo program early on was back contamination and developing a quarantine facility for the astronauts. Were you involved in any of those discussions or planning?

CATTERSON: Oh, yes. [Laughter] That was probably one of the most painful experiences that we had in the medical support side of the program, at least to me it was, because this panel of scientists who were appointed in Washington to give scientific advice to the administration, in their wisdom decided that the potential for contamination of the Earth from contact with an unknown entity, the Moon, was too great to ignore, and that some provision had to be made to protect the planet from that happening. Well, the only way that it could really have been done is not to let anybody come back alive.

It just was not realistic at that late stage of the design of the program to do something that would completely guarantee that the ocean wasn't contaminated if there were contaminants that survived reentry on the spacecraft. And there was no mollifying these people, as we tried to talk common sense and say, well, look the spacecraft reaches some enormous high temperature during reentry and it stays that way for a long time, nothing could survive that. They'd say, "Yes, but we don't know what we're up against, so how do

you know it couldn't survive?" It's a "When did you stop beating your wife?" type of question.

So I had no idea who came up with it, but somebody came up with these brilliant idea of swabbing the spacecraft down with Betadine as soon as the recovery people got to it after it had splashed in the ocean, and Betadine will kill germs. So the scientists said, "Oh, okay, that'll work." Problem was solved, case closed. It made no sense medically speaking. It was just a trivial gesture, but it satisfied the politicians.

Then the quarantine, the containment facility that was built at the center was very sound. It was all based on Army technology from biological warfare research that had been done, and so once they had gotten there, then the planet was reasonably securely protected, but from the time they really unfurled their parachutes in the atmosphere until they were back here in Houston and inside that facility, all this quarantine business was just sort of mainly show.

The trailer facility was, again, a pretty reasonable quarantine. It was on the ship. They walked through this little plastic tube from the spacecraft to the trailer, and if anybody believed that that was going to prevent these bad critters that survived the reentry heat from penetrating this 1 mill of mylar, I'd like to sell him some property. But it looked good, I guess.

BUTLER: Certainly at least was able to satisfy those with concerns to some degree.

CATTERSON: Right. It allowed the program to survive and to move along. But the folks responsible for the missions just hated this decision and they hated anybody who had anything to do with it. It was decreed, and we certainly never volunteered, that the medical directorate would be responsible for implementing this thing.

During a flight from Houston to New York to sit on a Configuration Control Board meeting, George Low and Chris Kraft were on the plane, and it was my turn to be on the meeting that month, and I was there, too, and something came up about the quarantine. I was asking them if it would be possible to modify something, would it make it easier to do, and George Low said, "I'm not having anything to do with your damn quarantine program. You figure out how to make it work, but don't expect me to lift a finger, because it makes no sense at all."

That sort of was a wounding thing to have thrown at you, but I agreed with him. It didn't make any sense. I was just trying to get it done. [Laughter] So I went back to my seat and I thought about it for a while, and then I went back, and they were sitting together talking, and I said, "Just for my education, if we were going to Mars instead of going to the Moon, would you folks still be as resistant to back quarantine concept as you are to this one?" They refused to take the bait. George said, "I don't know enough about Mars to make an opinion about it. I'll tell you when we get there." But that lunar quarantine thing was anathema to them, because it cost resources and it cost time and it cost energy that they wanted to divert to more important things.

BUTLER: Certainly, again, though, it was one of those unknowns that—

CATTERSON: Yes. Well, yes, it was, but I think we could have accepted that risk and very safely. It just amazes me sometimes.

BUTLER: Certainly a lot of different aspects of the program, some good, some not so good, that all make it work.

CATTERSON: Well, it was a decision that was made. The folks who made the decision were handed the responsibility for advising at the highest level of government what was the safe thing to do, and it was the route they took. So our course of action was sort of preordained at that point. All we could do was to do the best they could with it. As I say, I really think if you had looked at the charge that the panel gave NASA, then the only solution would have been to forget about going to the Moon or to just sort of tell the astronauts that they had a cyanide pill to take when they got there, because they couldn't ever come home. Those weren't acceptable alternatives, as far as we were concerned.

BUTLER: No, certainly not. We're about at noon now. I do have a few final close-out questions, maybe about a half an hour's worth, so, but I don't know what's—

CATTERSON: That would be fine.

BUTLER: Okay. Do you want to break to call?

CATTERSON: I think we can just keep going.

BUTLER: Keep going, okay.

CATTERSON: As long as we're not into suppertime before long.

BUTLER: Yes, I'm sure she'd begin to worry about you by then.

CATTERSON: I think so, yes.

BUTLER: Certainly don't want to—we'll get you out of here in time for a good lunch. I'll tie a few things up. I'll tie out a few, and then ask Rob and Kevin if they have any.

CATTERSON: Okay, that's great.

BUTLER: You had mentioned before as you were moving into management positions and getting a little bit away from what you had originally started out with, that maybe you were even beginning to feel a little burned out and such, and eventually made the decision to retire after Alan Shepard was able to return to flight. What did you then move on to at that point?

CATTERSON: Well, a venture of—we opened an aviation medically oriented practice up at Houston's Intercontinental Airport, and Dr. Berry was associated with that venture at the beginning. It was an effort to see if you could sort of inject a military model of an aviation medical office into a civilian airport and if there would be a need for it and if it would be a productive means of practicing medicine.

We approached the City of Houston, and the mayor was Louie Welch at the time and he was exuberant, very enthusiastic about the whole idea. I think he figured it would be good press to have something that had its roots in the space program associated with the city.

So we did open a practice that we hoped would be exclusively dedicated to the support of aviation, medical support of aviation at Intercontinental Airport, eventually. It took a while to get it organized and it took a while to find a space and to work out economics of the program.

At about that time, Dr. Berry got transferred to Washington with NASA as the Director of Space Medicine up there, so he just was kind of out of pocket and I was the banner-carrier for the practice. It went okay. The airport was only about a year old up there. It was in sort of an underdeveloped part of Harris County. I remember the director of

aviation at the time, I think was Joe Foster, who said that they had had a case where they had to send somebody by ambulance to the hospital and the nearest hospital was Parkway, which was a good ways down Interstate 45 from the airport. He said when the ambulance pulled up, the back door didn't work and they had to tie it closed with a rope. So he was very happy to see somebody with medical credentials on site.

BUTLER: I'm sure.

CATTERSON: It turned out that we were more involved in community medicine than we were in aviation medicine at first, and that's just as well, because we could have never paid the bills just strictly doing flight physicals and fitness-for-flying examinations. We did those things for the airlines and for the pilots, and I gradually developed a following of pilots who still get their FAA [Federal Aviation Administration] physicals from me till this time, but that was a very slow-changing process. There were so few doctors in the area and it was just beginning to really emerge, as far as population was concerned, that I ended up involved in family medicine for a good many years, as well as the airport practice.

But we built a clinic building on airport property. The mayor came and cut the ribbon to dedicate the building. We got a lot of nice press from it, all of the three network news folks were there, and [I have] been there ever since.

Many years later, I was approached by Dr. Kelsey, who, interestingly enough, had been in that aviation medical task group at the Mayo Clinic at the same time that Dr. Lovelace had. The Kelsey-Sebold folks had won the contract for occupational medical support at the space center when it was decided that that should be contracted. So when I left NASA, I almost went directly into the Kelsey-Sebold Clinic, but this experiment at the airport had more appeal to me.

I learned that Dr. Kelsey had approached the airport a year before, suggesting that they open a little first-aid room up there as a branch, and he very generously gave me all of his research into the subject. Then about ten years later, he approached me and said that Kelsey-Sebold was going to be branching out into neighborhood type of practices and they were going to come up toward Humble, and would I be interested in a merger. I was, and did become a member of the Kelsey-Sebold family at that time. They took over the clinic and operated it for a good many years.

Finally, as managed care became such a dominant factor, they decided that the tiny airport clinic was just not a viable thing to maintain. When I retired from that group a few years ago, they kept the clinic going for about a year and then closed it down. So I'm at the present time just working a very short work week doing strictly aviation medicine after all these years and working at a clinic that's very close to the airport.

BUTLER: Have you done any work with the space program during that time, or participated at all?

CATTERSON: Actually only as an alumnus. There have been a couple of reunions of folks that were in the medical support office over the years. When Carolyn [L.] Huntoon, who was a scientist in the program when I was there, was Director of the [Johnson Space] Center, she had by invitation homecoming gatherings where she would sort of seek the input of some of the people who had been in the program in the past and give us a day's briefing as to what was going on and what was happening to the program at that time. This was before she was Director of the Center, it was when she was the Director of Life Sciences for the Center that she did that. I thought that was very innovative. So I came out to those kind of occasions, but I haven't really been back or had any sort of hands-on involvement.

When I first left, we did bid for and we were awarded a contract which had to do with demonstration of feasibility of telemetry of medical data on the ground. It's been done under several different auspices over the years. There was a flurry of interest in a subject that Dr. [Michael] Debakey got involved in a few years ago when there was a natural disaster over in Armenia. They did some telemetry where they would look at data and they would advise surgeons over there as to what should be done.

Our project involved a NASA-type of miniaturized videocamera and I would see patients who, even in those days we had informed consent, a cruder form, but we'd tell them what was going on and that they would be participating in a research program and they would agree to do so. Then I would have video pictures taken of the examination of the patient and video pictures of X-rays, if X-rays were part of the investigation. Those would be my telemetry reviewed down here in the Clear Creek area by a group of doctors over at the Clear Lake Hospital, and they would express an opinion as to whether they were very comfortable with the information, if they had a high level of confidence in advising how that case should be treated or didn't have.

So that went on for a while and it provided some income and a lot of interest, but I don't think it changed the course of history in any tangible way. That's probably the last contact I had with NASA in a sort of an interactive fashion.

BUTLER: That type of medicine is seeming to gain more attention nowadays.

CATTERSON: Oh, it is, yes.

BUTLER: It has a lot of possibilities to it. Certainly an interesting area.

Looking back, actually one thing we neglected to talk about, were you involved with anything in Skylab, in any of the planning for that?

CATTERSON: Well, they used an extension of the same methodology for approving experiments in the Skylab program that was used in the Gemini program, and some of the same people were involved. I did have a role to play in the early planning stages for Skylab in configuration planning and in getting contracts set for some of the medical equipment that was used in the Skylab program, but I left before it was even certain whether there was going to be Skylab or not, and just again watched from the sidelines, tuned in my TV, and was pleased to see that things went pretty much according to the early plans, in spite of all the improvising that they had to do to get Skylab habitable.

BUTLER: Did you have any opinions at the time as they were talking about doing the program as to whether the amount of information that would be obtained would be valuable in the long-duration space flight?

CATTERSON: I thought it would be. In fact, I didn't know any other way that we could get the information. I think it's essential to have some long-duration stays in the space type of environment during which there's a systematic collection of data and hopefully building on what's learned to structure future studies and ongoing studies, and so I think the Space Station approach is a great way to go. I don't have any strong feelings about whether it would be better to do it in orbit or better to do it on the Moon as a platform. I think you could do it either way.

But one of the questions that we were confronted with day after day in the medical support part of the manned space flight program was, for very long-duration space flights, for a mission to Mars, as an example, or as a model, will we need to provide artificial gravity or will we not.

CATTERSON: The engineers were looking to us to come up with an answer [right then] for that question, and we couldn't answer it. As far as I know, it's an open question even today, because it all hinges on this question of whether there's a continuous lack of acclimatization to force of gravity if you don't have gravity around and whether you can provide countermeasures for that, short of running an artificial gravitational field.

So I think that the Space Station has tremendous importance to the future of human exploration of space, in addition to the opportunity to provide maybe some novel ways of conducting scientific studies, just by virtue of being an orbiting platform.

BUTLER: Certainly look forward to seeing it get up and running, the new one.

CATTERSON: Oh, I do, yes. I can't wait.

BUTLER: Should have some very interesting results, I'm sure.

Looking back over your time with NASA, is there any point that you would consider to be your greatest challenge?

CATTERSON: That's an interesting question. I suppose the greatest challenge throughout the program was to try to keep a dialogue going so that there was mutual understanding on the part of the life sciences people, the folks trained in biological disciplines, with the engineering and physical science people, and that we would communicate with each other a way that both sides heard the answer the same way to any given question. It's amazing how much of a barrier there is there, sort of the Grand Canyon, a gulf, in understanding. There were a lot of jokes about we don't speak engineering, we only talk biology. There's some reality behind those jokes as to the difficulty. I think that was probably the biggest challenge that I had all along, was to make sure that what I said sounded to my counterparts in the

engineering world's ears the way that it sounded to me what I was saying so that they didn't think that I was saying something entirely different and come up with the wrong impression or with a different impression than was intended. I think that the acceptability of the medical people in the program was kind of rated based on how we were able to do that job, to meet that challenge.

BUTLER: Communication is certainly a big part of making this all happen.

Is there any one point that you would consider your most significant accomplishment or contribution to the program?

CATTERSON: I suppose that would be hard. Personally I think probably the day that I, according to George Low, changed his mind about continuing biomedical telemetry in the manned flight program. That was maybe my finest hour in the program.

BUTLER: Very significant. Very important.

CATTERSON: Again, the whole issues was communications. I just felt if I could get him to see it the way that we saw it, then it would be a no-brainer. But things were going the other way for quite a while.

BUTLER: Talking about George Low, and you've mentioned Dr. Berry and several of the other individuals that you worked with throughout the program, are there any that stand out significantly to you that they were vital to the program or made a big difference in your career and how you were doing things?

CATTERSON: Well, yes, I suppose our lives are touched by people who were sources of inspiration. Dr. Lovelace was one way back. Dr. Berry, probably without knowing it, molded my career when I first got out of medical school and as a teacher at the School of Aviation Medicine in the Air Force, because he made it seem to me that this was really something worthwhile that you can do as a full-time undertaking, and not just kind of a way to get some extra pay by being rated as a flight surgeon.

I found Bob Gilruth to be an inspirational leader, a gentleman, somebody who just didn't have a mean bone in his body, and yet commanded instant respect because he had such an all-encompassing knowledge of his field and what he was doing, and a great capacity to inspire confidence in people around him.

I think Chris Kraft was one of the people who should be in the all-star recorded history of contributors to the space program. He certainly was somebody that I looked to as a role model.

George Low was just the right man at the right place at the right time. The Apollo program might not have been turned around if he hadn't been there and been such a firm hand.

I'm very pleased that [JSC Director] George [W. S.] Abbey is where he is now, because he was one of George Low's deputies and he had major responsibility and he had a lot to do with keeping his portion of the program on schedule and in budget. I just sort of took my cues from the way those folks led their lives, and I think I learned from all of them and many more that I'd have to spend a lot of time thinking about.

BUTLER: There's certainly a lot of important and unique people that helped bring it all together.

CATTERSON: They were, yes. Inspirational people.

BUTLER: Hopefully through this project we're able to talk to some of them and hear about others.

CATTERSON: Good.

BUTLER: At this point I'd like to go ahead and ask Rob and Kevin if they have any questions. Rob?

COYLE: I just had a couple of things that really caught my attention. You were talking fairly early on about when you were still at Lovelace working with the somehow acquired Soviet data from the early cosmonaut flights, and what really struck me when you described that is that's a great example of where your contribution to the program comes in, because you were being asked to essentially remotely monitor even in a historical manner this way, and that's something that really struck as I was doing the research is how there was sort of a balance that had to be struck between the more science-oriented and the fact that we were going somewhere and it had to be done in an operations concept.

I was wondering, did you learn that from Dr. Berry, was that a contribution of yours, the ability to hold to some standards, but on the other hand keep an operations mind-set?

CATTERSON: Well, it was probably all part and parcel of the training of a military flight surgeon. I never consciously thought about it, but I think that's the basic job of a military flight surgeon, is to be a part of the support of mission operations, to do everything possible to keep the crews ready to perform in a combat situation and whenever the need might arise. So we were given some tools and some skills and some methodology in our training by the military that spilled over.

I think the whole concept of being a physician is sort of mission oriented. If somebody's sick, you want to treat the illness and get them back on their feet and get them well, and so the ways you go about that naturally support the hands-on supportive missions, the operational orientation as opposed to pursuing science for the sake of science and letting the questions lead you down whatever path they might take. We clearly weren't into that mode of operation in the program.

So it didn't really surprise me that I was being asked to look at telemetry data and to interpret it in terms of what it meant about the physiology of the person who was generating that telemetry at the moment, because you kind of do that at the bedside as a doctor, but here we weren't able to see the individual. We were just getting bits and pieces and trying to fit them together and synthesize them into what was happening. But to the best of my knowledge, that's where it all comes from and it fits together. It was easier for us to be doctors supporting operations and more natural than it would be for a graduate of medical school to go into pure research. That's kind of a sharp turn in a path, for the most part.

COYLE: Do you have any nostalgia surrounding John Glenn's return to space, when he went back on the Space Shuttle?

CATTERSON: Yes, mixed feelings. I was pleased that he was able to do it. I began to sort of have *déjà vu* sensations and reminiscences about when I was in the program when he was an astronaut. He was one of the early one that I met. At the same time, I sort of felt disgruntled about the claim that this was going to be some sort of great scientific contribution to the understanding of aging and weightlessness, because John and everybody else in the world knows you don't learn very much from one single case study when it comes to biological phenomena. So again, it served a purpose, it justified his getting on the flight, and nothing

bad happened, and so I think it's great. I wasn't upset by the fact that he was able to fly; I was just kind of upset by all the lies that were associated with the enterprise.

BUTLER: Kevin?

RUSNAK: I did have a couple, one substantive, the other more anecdotal, I guess. But earlier on you'd mentioned the Crew Systems Division, and I was curious what role the medical people had in developing or creating requirements for the spacesuits, in particular.

CATTERSON: Well, a very strong role, I think. The art was reasonably sophisticated before the space program began. The Navy had a pressure suit for very high-altitude flying purposes. The Air Force had developed the fabric partial-pressure suit. The two technologies were kind of forced together in the Space Task Group, and there were lots of disputes between who had the better path to the ultimate truth, the totally pressurized rubberized type of suit that the Navy was using, or the Air Force, which relied on pressure to assist breathing and to make sure that the brain and head got oxygen and just real tight-fitting clothing for the rest of the kind of pressure.

As it turned out, the spacesuit was a little of both in the early stages. The medical people had to be there to interpret what the man needed and try to quantify the requirements into specifics, so that the engineers could know what they could get away with and what wouldn't be acceptable. The breathing atmosphere was an example of that. They had to go through a series of validation tests to establish that it was okay for long term to allow people to breath 100 percent oxygen at a third of an atmosphere, or 5 psi, as opposed to air or a mixed gas breathing fluid at a higher pressure.

Once the physiology was settled, ironically, during the studies that were done at military altitude chambers, there was a series, there were two or three fires in which there

were fatalities in those chambers, and the medical people kept reminding the engineering community about those fires, and the engineering community kept saying, "Just tend to your physiology, Doc. We'll handle the fire risk problem." It sort of came home to roost when our disaster happened, that we shouldn't have been as passive as we were, probably, letting those things go by.

RUSNAK: So with each program they had a unique type of suit. Was there any involvement with each of those, or just at the beginning?

CATTERSON: No, there was involvement with each step along the way, and there were physicians and physiologists who worked exclusively in the Crew Systems Division to make sure that those things were acceptable, as well as there was a lot of input from the astronauts. There was a lot of trial and error that it was necessary in getting something to work, and they'd come up with a new deusy of a joint that would allow greater flexibility in the wrist, and then they'd get the astronauts to give it try in the altitude chamber and to critique it. Then they'd go back and fix what was wrong with it. So that was day-in, day-out activity. I looked [at] it from the side, and then later on it was my responsibility to defend the amount of money that it cost to do that kind of work when it became part of our directorate. But I didn't really have any—I wouldn't have known how to do it myself, other than to provide some of those very basic physiologic requirements for a breathable atmosphere or pressure limits or that sort of thing.

RUSNAK: Were there a lot of budgetary challenges to this particular area when you were responsible for that?

CATTERSON: Always. There was a certain amount of money and there was never enough to satisfy everybody, so somebody out here that was into antenna research couldn't see why that many dollars had to go to biomedical studies when it could be better spent building better antennas. NASA worked on a year-to-year zero budget philosophy. You had to justify the budget for every dollar that you were going to expend every time there was a budget review.

RUSNAK: For the anecdotal question, I was curious, some of the astronauts were gaining particular repute for their practical jokes they would play on each other and others. Were you ever a party to this, either on the receiving or giving end of that?

CATTERSON: Not personally. I always sort of managed to stay clear, but, yes, as sort of the second-cousin I was, many times. Early in the program they had to provide a twenty-four-hour urine sample that was collected for twenty-four hours before each Mercury flight, to the nurse who was kind of their Mother Superior down at the Cape. She just looked after their well-being and did a lot of things that had nothing to do with nursing to make life easier for them, but was a very experienced Air Force flight nurse.

So one of the astronauts presented her on the morning that he was there for his physical with this Ozarka water jug that was full of yellow fluid, you know, with a red ribbon tied around it. He said that it was his twenty-four-hour urine sample. [Laughter]

One of them practiced for months and months and months to perfect an abnormal reflex for one of the neurologists, because on their pre-flight examination they would go through a series of specialists and each specialist would sort of test them from the standpoint of his clinical expertise. The neurologist was doing these tests, and this guy had been on two or three flights and so he knew it was coming. So there was this thumb reflex, where you tap the thumb and you're supposed to get a rebound type of thing. If the person has a central nervous system lesion, the thumb will go the opposite direction. So he thought he had it

down to where it was going to really get the neurologist's attention. He did his little trick. And I'll never know, because I wasn't there, but I was talking to the doctor after the fact, and he said, "Well, it was a pretty good try, but I knew right away what was going on."

One of the astronauts said, "You should have seen his eyes when that happened. They got as big as dinner plates." [Laughter] He was delighted with his trick having worked. What the actual truth was, I'll never know. There were numerous things that went on.

I had the opportunity to fly in the F-16 with them a number of times, but I always felt that it was probably prudent if I just sort of kept both feet on the ground, because I've got a real glass stomach when it comes to motion sickness. I don't think it would have been a real comfortable flight.

RUSNAK: I'm sure they wouldn't have gone too easy on you.

CATTERSON: Not really, no, I don't think so.

RUSNAK: All right. Well, that's all I had. Thank you.

CATTERSON: Sure.

BUTLER: I want to thank you. You've certainly had an important contribution to the space program, and thank you so much for sharing it with us.

CATTERSON: I could go on for days about it.

BUTLER: Well, we could go on for days hearing about it.

CATTERSON: But definitely worthwhile.

BUTLER: Definitely.

[End of interview]