ORAL HISTORY TRANSCRIPT

JOHN R. BRINKMANN
INTERVIEWED BY SUMMER CHICK BERGEN
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BERGEN: Today is March 16, 2001. This oral history interview with John Brinkmann is being conducted in the offices of the Signal Corporation for the Johnson Space Center Oral History Project. The interviewer is Summer Chick Bergen, assisted by Kevin Rusnak.

We thank you for being here today, Mr. Brinkmann.

BRINKMANN: Glad to be here.

BERGEN: Let's start out with maybe any early interest that you might have had in aviation or photography. Did you as a child have any interest in those topics?

BRINKMANN: Well, I think, as I recall, there was about a camera or two in our family for as far back as I can remember, right back to the little box Kodak. I think I became interested even then as a youngster, and also in high school, and I worked on the annual. I'd taken a lot of pictures for the annual book. Then later on, well, I always wanted to have something to do with aviation, even from when I was very, very small. I took my first flight with one of my sisters when I was about maybe seven years old, eight years old, and had built many models from then on into the time that I went in to the service. And during our spare time in the service, I still had kits I was putting together, things like that.

But my main interest even early on were in either chemistry or flying, and it had to be one or the other, as far as I was concerned. So I started out that way in college, and I took the regular engineering courses and what have you. But in the back of my mind was something that had to do with flying. So I seriously thought about dropping out there and going to Parks Air College. I think it was located in St. Louis or close to St. Louis. But all that changed rather quickly in 1941, and that did give me the opportunity to fly, because I immediately enrolled into the Air Force Reserve program and waited to be called up and went into the aviation cadet program.

My first base was in Santa Anna, California, and this had to be early in 1942, just a couple of months after the attack on Pearl Harbor [Hawaii]. I had two brothers already in the service, so I was the third one. Although I was the youngest, I had one other brother and he joined the service a little later, so my family had, out of the five boys, four of them were in the service at the same time. We never really met. Well, one time I met my brother Gene when I was being transferred from a base in New Mexico to the East Coast, and I met him in Nashville [Tennessee], but that's the only time in the four years that I ever met or saw any of them again.

I think one of the questions you asked me to address was what kind of exposure did I have to photography during the war. Well, when I was stationed at Clovis, New Mexico, I was asked to go to a school in Colorado, Lowry Field, I believe it was, around Denver. Why I was selected to go over there to learn a little bit about aerial photography, I don't really know why they asked me, other than the fact that we did photography within my line of work. I was stationed in a bomb group. At that time they called it a heavy bombardment group. Photography was part of what we did, mainly with photographing bomb drops and so on, the accuracy, whatever it was that we were doing at the time. Also, we did some, I recall camera bombing. So it wasn't always a matter of dropping bombs. It was a matter of having cameras in the back of the aircraft. You had to go to a selected target in a selected city, and you'd be photographing your approach to the city, whatever the target was within that city, and to see whether you were lined up properly, whether you actually passed over the target to be sure that you got the target you were supposed to be after, that kind of thing. So that's about all we ever did in that line of photography.

When I got out of the Air Force, I started out in the Army Air Corps and got out when it was the Air Force in a period of these few years. In the interim years that had passed, somehow I went to Langley Field, Virginia. I was stationed there with the 302nd Bomb Group, and within a few days I met a young gal who turned out to be my wife. So that was the beginning of our marriage. We were married some months later.

Then we went to another base in Savannah, Georgia. By the way, I was an instructor most of this time. Right after I got my commission, we were all, that particular group that I was in, we were all made instructors. They were a small group, and we probably knew more about the aircraft that we were flying as aviation cadets than the young lieutenants coming in from the regular bombing schools. When I left to preflight, this was in Santa Ana, California, where they must have had, oh, I don't know, eight or ten thousand cadets there by then. So somebody put the finger on a hundred of us and broke us up into groups of twenty-five and sent us to various bomber groups throughout the States. Some of us went to B-24s, and some went to B-17s. So even as aviation cadets, we were right in with the bombing crews. So after we were commissioned, why, they just kept us on and we were training the young lieutenants that came in. So that's kind of the way that it stayed all the way through.

But upon my discharge at Langley, I chose Langley as a point of discharge because that was where I thought I was going to make my home. I wasn't sure. I think this was in October—October, November of [19]'45—and one of my sisters-in-law had been working for NACA [National Advisory Committee for Aeronautics]. Of course, I had nothing in mind that I was going to do immediately, so she did suggest that maybe I could go out to see the personnel officer at Langley because they were hiring people and they were in some kind of expansion program. So I went out for an interview, and they had a position open in the photographic area and somehow or other I got in there with the little experience I had. Started at the very bottom and stayed within the still photo and the motion picture photo area and also the laboratory work. I did all of it from the very bottom right on up.

I think you also ought to know some of what we did there later on in the way of photography at Langley. I never was interested in photography that had to do with people; it was always more or less directed toward the engineering side of it and collecting data. Very early, maybe I hadn't been there over about maybe three or four months, when a call went out throughout the center to find some guys that would go to Wallops Island in Virginia where the small missiles were being fired. Dr. [Robert R.] Gilruth was the man more or less in charge, even at that time. So there was a kind of a cadre of us, some electrical engineers, mechanical engineers, aeronautical engineers, photo people, and we kind of formed a group and we'd fly or sometimes take a boat from Langley out to the island. The island is rather small. It's only about a half mile across and less than maybe a mile long. And there was nothing out there, nothing but salt grass and sand dunes and Chinqateaque ponies running wild all over the place. Many times we had to chase the ponies away from what little launch activity we had up there just to get them out of the way. They stayed there really for quite a long time.

We did many things there. The first vehicles that flew from there were called RM missiles, and I guess, I don't know really what that meant, but research model, I guess. The source of power for those little rockets, they weren't over about five feet tall, and, as I recall, they were using a regular old 70-mm rocket, I guess you'd call it. It used to be hung on the wings of the fighter planes in those days. So one of these would be rammed up the back and what have you, and they provided the source of power. The engineers were looking for data in the normal, well, things that really had to do with the roll, pitch, and yaw parts of flying, you know, basic things, except that these were free-flying. There were three channels of telemetering, and that was a terrible job to get those channels of telemetering to work. Today who knows how many they've got? And they do it in a different way, obviously.

Later on they were doing some wind tunnel work up there. They were testing certain sections of the aircraft, for example, a section of the wing or a section of the tail, to see how it would hold up under a temperature range and getting into supersonic flight. The reason for doing that up at Wallops was because of the noise these tunnels made. These were a particular kind of tunnel. I think they were called blow-down tunnels, which they had these large spherical containers with compressed air and up there they not only released air at supersonic speeds, but it was also heated. So the panel would be put in the blast and our job was to photograph these things to see what would happen.

Even though the tests were relatively short, we had to take pictures at a very high rate. By the way, these panels would have grids painted all over them. Usually they were black so they could be easily seen. The picture rate was quite high, in the order of, as I recall, about

1,000 to 1,200, 1,500 pictures per second. This was done with a Fastax camera, except that the run time during the blowdown stage was, oh, as I recall, in the matter of, oh, maybe thirty seconds or so. So in order to be able to photograph the entire event, each camera had to run in tandem to each other, so that you would increase your running time, and at the same time you had to tie the information, the camera system, to the recording mechanism, whatever they had. So it was not uncommon at all to have maybe fifteen to eighteen or twenty of these Fastax cameras running at the same time taking pictures at different angles. As one camera would run out or before it ran out of film, a second one would come in, and at that rate, why, with the number of cameras we had, we could photograph the entire event.

Now, the film capacity of these cameras, I think it was 400 feet of film per roll. So it doesn’t take long for a roll of film, 400 feet of film, to go through a camera at a thousand pictures a second. So it was all very, very precise timing, and it was all interlocked. The cameras were tied right into the recording systems.

In order to correlate all the data, the Fastax camera, I need to comment on that a minute. It’s not a commercial camera unless you have a shutter. You had a rotating prism inside the camera, which projected the image onto the film on a sprocket. In order to provide timing, a little metal slug was embedded into the sprocket wheel, and as it made one revolution, it passed by a magnetic probe inside. That in turn sent out a signal to provide a time base to the other instrumentation that they had, so that whatever strain gauges and things were used on these panels, the pictures could be tied right to them. That was one series of tests up there which was very interesting and very noisy and very dangerous. We never were able to stay within the chamber at all. Once we got the cameras loaded and in place, everyone evacuated the whole area. They made a tremendous noise. You could hear it for miles and miles.

Other things that we did in the wind tunnels were—are you familiar with the shadowgraphs or a Schlieren pictures?

BERGEN: No.

BRINKMANN: I've got some out in the car. I should have brought them in here. It might have made it easier for me to tell you about this.

BERGEN: We can pause if you'd like to go get them.

BRINKMANN: Would it help you?

BERGEN: Sure. [Tape recorder turned off.]

BRINKMANN: These are Schlieren photographs. What's happening here is this is a model put in the wind tunnel, all of these put in the wind tunnel, and through a system of mirrors and lenses and a system that they call a Schlieren system is set up. The lines that you see here, all these lines are shock waves in front of the model in the tunnel. The way these pictures are made, a point source of light was used, I think, with a mercury vapor lamp. The light would be projected onto a mirror. Then the mirror would send the light through a large panel. It wasn't glass; it was a quartz window on the side of the tunnel. Out on the opposite side there was another mirror which picked up the light and brought it to a point. Then the camera was focused on that point, and the image was actually projected down the lens barrel onto the film. What you see here is a pile-up of the air. This is a blunt body, and the air is actually piled up here so it makes an image. In a Schlieren system, like I said, this is done with the lenses and mirror.

Your shadowgraph is somewhat similar, but you have a point source of light again, but there are no mirrors involved. It's just a matter of a point source of light hitting, going through the pane of glass again, and this image is projected onto the opposite wall of the wind tunnel. The picture's made and there you have it. So you're really photographing a mass of air in the tunnel.

We did a lot of work like that in these tunnels. Usually this was done at night. I guess it was because it was cheaper to run the tunnels at night when they probably got a cheaper rate on the kilowatt hour, whatever, than in the daytime. These tunnels could take a lot of electricity. Not only that, this is all done in a dark chamber anyhow. So the light in the chamber when you're conducting these tests is that one point source of light in there. That was one of the things that we did.

Then the engineers were always interested in stresses and strains on the various sections of the aircraft, be it the wing or the tail section or whatever, whatever, and they were always looking for new methods of trying to see the flow of air over the—well, let's say the wing surface or whatever, and various methods were used to attempt this. I know in one particular instance in a very small chamber where they were beginning to operate in the hyperspeed range, the model in the tunnel was coated with a substance which is very similar, whatever a mothball is made of. It's that particular material, but it was an ablation process where the model was coated with this particular material. Then the tunnel was immediately brought up to speed and this material would begin to ablate. As it ablated in the ranges, let's say the surface was either hot or the air flow was stronger or whatever, it would create a pattern on a wing or on the model inside. We'd photograph this so they could study the actual flow of the air over the surface to see just what was happening. That was one method.

Another one I recall, they used some sort of oil on the surface, and again it was done in the dark and the source of light was ultraviolet. So when the flow and the air, I guess, got hot, I'm not sure how hot it was, but, anyhow, you could see the flow pattern of the oil in ultraviolet. Another method was to put tufts of yarn all over the specimen you were testing. Usually this was a light-colored model and it was black tufts which were put on the wing. Also you could see where the air was smooth or where it was turbulent and where it was stalling and this sort of thing. That was used a lot in a lot of different ways.

At first it was thought that you had to photograph these things at a relatively high speed with motion pictures. Probably the fastest cameras we had in those days were Mitchells [phonetic] and a few other cameras that would get up maybe to as high as 128 frames per second. But all of these cameras had the typical pull-down mechanisms inside the camera, and you couldn't go over just so fast because you'd eventually just tear up the inside. If you put too much current to the vector motor, it would just absolutely just tear out the insides of the cameras. So that was a limitation there.

The next range of speeds up was, as I mentioned a little while ago, the Fastax camera, which started at 1,000 frames a second and went up to 4,000 thousand frames a second, but there was very little in between. Well, the high-speed cameras didn't have as good a definition as the normal motion picture camera would have, just due to the rotating prisms and what have you. The image was put on the film more or less on a sweep basis as opposed to a shutter which chops it off and you get a clear-cut picture.

As I started to say, it wasn't always the speed that was necessary. Another way of showing these clusters, they aren't doing exactly, you know, you could bring them to a stall if you want and you'd use a strobe light. You'd strobe until you got those frequencies to how the yarn was fluttering. You got on that frequency and you could stop the motion at any point that you wanted. So you could use a much slower speed in the camera and accomplish the same thing by freezing the image.

The engineers, in many cases, they would just use the variac [phonetic] and change the speed of the camera. If you reached a particular point that he wanted to study, he could just practically stop his tufts right there and see what they were doing and what the patterns were. So if the frequency of the tufts, let's say, was forty frames a second, so you'd use a strobe light at forty frames a second, you could freeze it. Then by varying the speed of the electric motor again on the camera, the camera motor, you could begin to put the tufts back in motion again. And that was a very effective way to do it. So it wasn't always a matter of having the extremely high-speed cameras to do it. Running time then became no object because you could use large film magazines and do it.

Then we were doing this in the wind tunnels and missile range tests along with everything else, and the NACA laboratories, they were doing many things. They had the two large tow tanks where they were testing the seaplanes and what have you. We had cameras aboard those photographing the wakes and what they call, I think it's a roach [phonetic] effect of behind the camera. I really don't know what they were attempting to accomplish here, but, anyhow, we were there to photograph all this stuff, maybe to see whether the spray would get into the propeller areas or just what was happening.

This was back in the fifties that I'm talking about now. So, really, a lot of these models that you see here, you recognize the shape of the Mercury capsule. So right here you can see what was happening on the blunt side of the Mercury.

I think within the late, had to be the late fifties, we began working on the manned space program. This is the very beginning now. When the Mercury design was more or less established, they needed to get information on the parachutes and the drogues that were eventually going to be used in the recovery portion of the flight.

This all began with a boilerplate, very much nothing but a metal canister in the shape of the Mercury. It was dropped from an aircraft. I don't recall, I think it was a C-119 or something like that. It was a cargo plane, at any rate. Apparently someone within NACA had made some contacts with the Air Force to get this airplane. They worked out some kind of agreement. But, anyhow, this boilerplate was attached to a sled made also of a piece of angle iron, a very gross-looking thing. That was carried aloft and then it was dropped from the back of the airplane. In order to get the close-up pictures, first of all, you had to be sure that everything worked all right and it was going to extract itself from the aircraft without causing any damage.

So two of us in the photo area, I had the flying experience and the other guy got his. We had to go through the regular routine with the Air Force on all ejection seats and chamber testing and all this kind of stuff. Anyhow, they made these drops from about 20,000 feet. I was still in the Air Force Reserve at that time. I talked to some of the people over there to see whether they would provide an aircraft for coverage. Here again, these are a couple of young lieutenants just eager to do something like this.

We'd get in close and get right behind this aircraft and it looked like we were flying it up the back end of the thing to get some good close-up pictures as it came out of the aircraft. Of course, once it went into free-fall, you know—they gave us two jet aircraft, T-33s, and I usually flew the high position and the other, my counterpart, flew the lower position. I was usually up around maybe the 20,000-foot level. He was down below around 10. So I photographed the extraction as far down as I could, and then they would pick it up and take it on down to the splashdown in the water. Now, we didn't get photographs all the way down because there was no way. By the time the thing got out of the aircraft and was on free fall, you had to put that T-33 into some pretty severe conditions, practically stall it and then dive straight down to see whether you could still keep it in view of the camera.

So this aircraft went through all sorts of gyrations, and a little, old four-pound camera suddenly becomes maybe twenty-five, thirty pounds. You just try to hold it and focus it and keep it on the aircraft. Well, you can't get it all the way, but we got it most of the way. And it proved that the thing did extract cleanly and the drogues did come out and did go down to the water.

The next step after that, of course, was to drop the real thing, something close to the real capsule. We photographed those from the same technique from 20,000 down to the water. Then later on, when they began to fire, it got into the Little Joe series. By then we had all sorts of camera installations on the ground. We had already gone through the pad abort test. They used the Mercury model with the escape tower on it. All that testing was done on the ground. Now they were getting to the Little Joe into the flight tests.

This was all very interesting, too. Again, we used the same two lieutenants with the same aircraft, only this time when they got ready to fire from the ground, we orbited over the Salisbury radio at Salisbury, Maryland. We were in a countdown. The idea here again was to photograph, instead of the thing going down, to catch it coming up. So we got into the countdown, and it took a number of seconds. I don't know how long it was now, but I think it was on the order of eighteen to twenty seconds for that thing to get up to where we were. So you had to get in close enough to see something, but they wouldn't let us get in too close. I don't know what the range was, but I think it was something like 1,500 feet. They didn't want us to get any closer than 1,500 feet to where it was going to come up.

But it was kind of an odd feeling to know that, hearing the count-down, they had fired it and you don't see anything yet. You're just flying up there and it's coming up by you, but you had to dip a wing to see what was happening and then get the cameras out and you could see this huge doughnut of smoke below you, and the missile comes straight up at you. We just photographed it going by as far as we could see it. Obviously we couldn't go up as high as the missile finally went, but we saw it coming up and we had a really good view of it as it topped up. Again, once the escape tower fired and the chutes came out, and the idea was to photograph it back down to the water again to see where they got a good, clean landing and photograph the chutes and how the chute was released from the spacecraft, which was all part of the eventual recovery operation. You had to jettison and get rid of the chute so that the capsule could float in the water and a dye marker and this kind of thing. So we did all of those flights.

I guess that kind of takes us into about the time that the astronauts came on board, which was a little later. Now, all this testing, years of this, the Schlieren testing and pictures and all the other engineering documents, they all led up to this one thing of putting a man in space. While all this testing was going on with the Little Joe series, there were several young engineers that I became very friendly with, who were—at that time it was called the Pilot Aircraft Research Division [PARD]. One of the young guys over there was Jack [C.] Heberlig. I don't think he's on your list. He was a pretty smooth talker, and so far as all of this, everything I'm talking about, when I say smooth talker, well, he said that eventually and, as a matter of fact, there were plans being formulated right then where we were going to put a man up there before too long. The project at that time, I think he referred to it as Project High Ride, and the idea was to take a man up and get him in space somewhere and then bring him back down. Later on, it was called—what was the flight that [Alan B.] Shepard [Jr.] and [Virgil I. "Gus"] Grissom took? It was a pretty high ride, up and down again.

Well, it was before then that they were talking about NACA or the government was talking about creating the Space Task Group. Now, when I was doing all this other stuff, there hadn't even been the Space Task Group yet, that is, the flying and all that. This was years before then. Rumors were going around that they were going to build a new center somewhere, and nobody quite knew where it was. Maryland was talked about at one time. I think Tampa, Florida, was talked. Houston was talked about. A few other places. Jack said, "Gee, you've just got to get with this program. Come on wherever we go." I didn't want to go. I'd been at Langley for eighteen years. My family was growing up there. But finally the urge got too strong, and I said, "Well, okay." So I transferred over from NACA to the Manned Spacecraft Center [MSC].

I asked for some of the people from Langley to transfer over with me. By then I think Houston had been selected. Didn't get any takers. Nobody really wanted to come. So I checked in with Mr. [Wesley L.] Hjornevik, Hjornevik. He was the personnel man for the Manned Spacecraft Center at that time. I asked him what he wanted me to do, and he said, "Well, I want you to build a photographic capability equal to or better than anything that NASA has or that you know of anywhere." And I said, "What kind of help do I have?" He said, "Well, you don't have any. You've got yourself." So he gave me one of these old yellow pencils, and then he said, "Have at it."

So, believe it or not, the person that did the typing and typed up the purchase requests in those day ended up to be Mrs. [Iva L.] Scott, who was Dr. Gilruth's secretary. Dr. Gilruth was just down the hall. I hardly ever saw him because he was always on the road doing something. So I began writing purchase requests and buying equipment.

No one could really tell you what to do. You had to use your imagination and to second-guess a lot of people what you thought you were going to do when you got on the job. But I think that the past experience at Langley and having worked with the people who were directly involved in rocket flight gave me a pretty good idea of what I should be doing. Also, I was kind of watching what the people were doing down at the Cape [Canaveral, Florida] at that time with their cameras and things down there in their laboratories. So you had to kind of anticipate what you might be doing down here, and I knew that we would be setting up a regular still lab. That was no problem. I could do all that. But it was where we were going from there I really didn't know, what kind of on-board cameras we were to have, and this sort of thing, but I did know that we were be collecting film from practically all over the world, wherever the spacecraft was going to come down. Maybe we could have our own people out there covering the reentry and the recovery of the astronaut, but I wasn't sure.

So some of these cameras that were used on some of the tracking stations used a different kind of film. It was basically the same film, but the mechanism for transporting the film was different. There were two types of perforations, for example, in the film transport. With the 70-mm film there was what they called the Type 2 perforation and the Type 1 perforation. The only difference is that the Type 2 had to do more with the commercial end of it, the Hollywood kind of thing of it. The other, Type 1, was for the photoinstrumentation. I don't recall the numbers exactly, but I think that in the Type 1 there were like four perforations per inch, and the other one was like five. So this meant if we're going to collect films from all over the world, all the equipment that we bought to be compatible with whatever we got in, or there would no need for us to have an existence at all down here. We had to do it all. There was no question about it. That's kind of what was said. They said, "You've just got to do it all."

So that meant traveling around the country to find people who were building equipment. I got many leads from the people at Eastman Kodak because they sold all over the world. They knew it. A lot of this was in the cover-up area. You couldn't just go everywhere, and the people wouldn't talk to you. But anyhow, I got enough leads and wherever I went and when we talked this perforation business again, it doesn't sound like much, but it ended up being quite important. When you bought the equipment, you had to buy both capabilities in a single piece of equipment that had previously been designed for only one. They said, "Well, we don't build that kind of thing." I said, "Well, maybe you've got to build it." And they were very receptive. The space program was the thing in those days, and everybody wanted part of it in any way, and it was not hard to talk these people into doing it. They bent over backwards to do it.

I remember going to Bell and Howell in Chicago any number of times. They had never built, to my knowledge, a 70-mm printer with dual capability. So I talked to some other physicists and engineers there and told them what was [needed], and they said, "What's your timing on this?" I said, "Well, about a year." They said, "You can't get all this done in a year." I said, "Well, you've just got to do it somehow." And, you know, they always came through. Somehow they always came through.

On another occasion we needed a particular kind of projector which would give us the kind of resolution we thought we needed. It was 70-mm film, and we had to make duplicate copies in positive color and also negative colors and then with prints and all the stuff that goes with it. So we went through the normal sources of supply and we didn't get many takers, but finally we found a little company in Phoenix, Arizona. We had some pretty stringent requirements, something like 200-lines-per-millimeter resolution from corner to corner on color film. Now that's stretching the limit of the resolution of a color film to begin with, but the optics at that time were always felt just a little better than the film resolution, so you could work against the optic side.

So this guy got on the telephone with us and he said, "I think I can do it." I said, "Well, I'd have to come out to see your plant and see whether we can reach some kind of an agreement." The time was getting shorter for the first Apollo flight, so I talked to our procurement officer. I think it was Dave [W.] Lang. I told Dave what the problem was. He said, "Well, fine. I'll give you a contracting officer and a buyer, and you take him out to this guy. You talk to him."

So then we got on an airplane and flew out to Phoenix. From about noon to five o'clock when we left, we had negotiated a contract. The guy got the money up front. He began work. At first he asked us what the timing was, and I asked him when he could do this. He said, "It would take me about eight or nine months." I said, "How about six?" and he said, "I can't do it in six." Well, he thought about that a while, because two days later he called back and said, "We'll do it. We'll take the job." But that's the way it was with a lot of things. You couldn't do that that today. Here was a case of getting a contracting officer to go out and talk with the supplier and sign a contract in several hours, and we were on our way back home, and the guy delivered. He got it on time, and we had it for the Apollo Program.

To get things done in those days, it was a matter of somebody who knew somebody who knew somebody. We needed two special 70-mm processors to process the film for several of the lunar missions. Now, this was going to be 5-inch format film. The objective here was to photograph the surface of the Moon from terminator to terminator continuously. Well, that presented a problem in, first of all, the film magazine that carried all the film aboard to do all that. To have a processor that could process all of that with a very high degree, you had to have the same film density from the beginning of each flight to the end of each pass around with practically no deviation, plus or minus nothing in terms of density, which in itself was a challenge.

The film magazine, the roll of film that went aboard these particular missions were 6,000 feet long, 5 inches wide, and it had to be processed at one time and one roll with continuous density from the first foot to the last of the 6,000-foot roll. Now, this roll of film weighs several hundred pounds. It had to be done that way. I think we had a magazine built here right at the center to contain this roll of film, and it was on a dolly and you'd wheel it up to the processor.

But we needed the processors, and we didn't know where we were going to get them. I knew what we needed, but they were built by a company, I think in Waltham, Massachusetts, a company called High Speed. The name of the processor was a Fultron [phonetic]. I got to inquire about buying several of those. They said, "Well, the Air Force is way ahead of you. They've ordered thirteen or fourteen of these machines, and you're at the bottom of the list." I said, "When will that be? When could we get them?" And I said, "By that time, our program is over. This can't be."

So, again, you know, you're going through the process with somebody who knows somebody, and I found out that the Air Force had these on order, but they didn't need two of them right away. So by knowing somebody, again, who knew somebody in our Washington headquarters who talked to the Air Force, the Air Force agreed to take the first two, the next two off the production line, and dedicate them to NASA. So we got our two processors in time for the flight.

Well, again, I'd say everyone was very, very cooperative all the way through.

You take it.

BERGEN: Okay. What other people within NASA did you usually work with? What other people or divisions did you interact with most often, and what kind of requirements did they give you and vice versa?

BRINKMANN: Well, so far as working with organizations, being in the kind of business we were in, photography, we worked all over. We interfaced with people in all kinds of work. Here, again, I'm reflecting back on the NACA days. But I think two people that I particularly owe a lot to is a fellow by the name of Bob Spencer at Langley, who was a physicist, and Mr. Edmund [C.] Buckley. He was the Division Chief of the Instrument Research Division. The reason I mention these two fellows is that, first of all, Bob was doing the kind of work that used optics in various ways and he helped me along a lot in the kind of work that I was doing there. Mr. Buckley, in his position as division chief, he was very well known throughout the center. I guess we got to kind of like each other or something. When opportunities came up, he opened the doors for me, and that meant a lot.

I think one of your questions was what kind of work did we do. Well, I mentioned the tuft studies and all these other things that we had done. There were strain gauges and things that were put on the surfaces of the aircraft, too, and the pressures or lack of pressure had to be recorded, and this was done on what we called—there were very large manometer boards. Now, a manometer [board] was a board that any number of tubes filled with either mercury or, I think, in some cases, alcohol. There may be a hundred or two hundred of these tubes, and they were, I guess, about six or eight feet high, maybe nine feet. Each one of the tubes was connected to a particular sensor that was on the surface of the body being tested. As the pressures increased or decreased, the liquid in the tubes either went up or down, depending on whether it was negative or positive pressure. That had to be done very, very accurately, because in those days most of this information was read by hand by people who actually took pictures or read the images on the film.

We were using surplus World War II cameras. I think they were K-22s or K-19s or something like that. This was on nine-and-a-half-inch aerial film. Of course, our lab out there processed this film. It had to be processed very, very accurately. It couldn't be too dry or too humid, because the base would either shrink or become brittle or expand or what have you and negate all the information that you had on these multitude of tubes that we had. We did a lot of that, and optics.

Then we had cameras that I had never heard of before. There was one in particular that we used, not often, but we had one of. I think it was designed for the Atomic Energy Commission. It was called a Beckman and Witley camera. This camera stood about, as I recall, six or seven feet high, and it took pictures at the rate of about in the neighborhood of two to three million per second. However, the film length was only about four feet or five feet, and it was put on the inside of the film drum. The camera had a lens that also had a rotating prism. The prism, of course, rotated inside the camera, projected the image onto the film.

As I recall, the inside of the camera was purged with helium because of the mechanism or something in there that was whirling around so fast that they had to have a lighter-than-air gas in there to show that this could be done. Then there was something called the lenticular plate that we used, and this was a plate at the back of the film. It had little lenses on it, and the image was projected on each one, and the film was placed behind each one of these little lenses, and [snaps fingers] that quickly you could photograph a thousand pictures, all at the same time.

Well, I guess these are some of the things that we did there. There were many, many more. They just don't come to mind right now.

BERGEN: At what point or did you ever, when you started, were you using off-the-shelf stuff, and then when did you have to move into making custom-made things for the space program?

BRINKMANN: In our line of work, I would say that almost all of what we did was in some form or another already in existence. It was a matter of modifying what was there to meet the human needs, human factors. You know, an ordinary shutter release just can't be a little button that you push. It had to be elongated or enlarged or someone operating it in some other way. So those were the things that you had to consider. Whatever it is that you bought, as you know, many of the cameras were tried and some of them were discarded along the way because they were too difficult to use.

The Hasselblad happened to be the kind of camera that was configured just about right. You could operate easily. With modification, it had a between-the-lens shutter, and the earlier versions had a so-called, I think what they called it, a capping shutter at the back of the camera, which, for our needs, we didn't need it. So the back shutter was taken out and the between-the-lens shutter was used exclusively for NASA. Magazines were enlarged. As always, in those days at least, the weight was always a factor. For every ounce or every pound or whatever it was that you put into a camera system, when you went to the Moon, you had one less pound of rock that you could bring back. So, again, the concept was trying to get three pounds in a two-pound bag was always in front of you.

So in the case of the film and film magazine, a normal magazine with the kind of film we were using, it would probably take a hundred pictures or something like this. By, again, talking to the Eastman Kodak people and the Ansco people, we got them to be recording their emulsions on thin bases, and we got an increase of about forty percent in the number of pictures you could get per magazine. Well, that helped out. Some of these emulsions were very unique, and the early ones they used, I think it was called the SO217, which was a special film that was more or less made for NASA. It was a thin base, a polyester base, 2-mil base. When you compared that base to the normal base on a film, it would be like making a comparison between Saran wrap and a heavy-duty, what do you call the other wrap we have now, the aluminum foil. The substance is just about the same. You take the aluminum foil and hold it out this way, and it'll stay there. This thin base, there's no substance to it.

The backing was one of the problems with that film at that time, and the processing started out to be a horrendous problem. Some people suggested that—well, we did, too, we'll have Kodak or the people who made the film process it. They wouldn't do it. They said, "We'll make it, but you'll have to process it." What they were looking at is failure, I think, in the processing, because the backing on this film, you have to envision a drying cabinet that's maybe six or seven feet tall and the film just goes up and down like this. It loops around, and you probably have several hundred feet of film in the drying cabinet at one time. The air flowing through there could create a flutter in the strands of film at they were transported through it. The base was very sticky, and if it ever touched, that was the end of it. It was like fly paper. Once it touched, it glued, and that was going to be it. They obviously didn't, I think, they did not want that responsibility, so we lucked out.

You know, there's a lot of luck on a lot of these things, and a lot of attention. These fellows that processed this, it's like tender, loving care all the way. But shortly after that, they changed it and they were able to make the base of the film still thin, but it didn't have that sticky backing on it. So all of these films that we used, and I think we used throughout the program, we probably used twenty different films, and, by the way, about twenty different cameras, varying in size from 16-mm to 5-inch, that longer one I just described a little while ago.

So it presented a problem in the lab to be able to process any of these films if they came back. Well, we knew what we used and what we had to process. So this created a—I call it a tank farm on the second floor of Building 8 over here [JSC]. We had over a hundred different kinds of chemical processes going at any one time. This meant a lot of attention, and to be able to ensure all of your chemicals were ready at the time that you needed them.

The motion picture line at that time, there wasn't too much—I'm going back a little farther now, before we bought all these processors—there weren't too many people or too many laboratories that could process the film, and mainly because, like, in Kodachrome, for example, the dye couplers were in the solution but not the film itself, which meant that you had to have a laboratory that had physicists and chemists and what have you to help everything on line so all these couplers would work properly.

The Ansco people at that time had succeeded in doing it in some limited way where the smaller laboratory was able to process a packaged chemical. So by this time we had made a commitment, more or less. I won't say "commitment," but we were thinking more and more about the Kodak films because of the variety of films that they had available at any one time. We had zeroed in on a certain kind of printing equipment, machinery which was compatible to film handling and the emulsions and the reproduction phases and what kind of film do you use and what kind of printing product, this kind of thing.

So, again, I knew a guy at Eastman Kodak, a good friend, and they weren't very eager to, at that time at least, they didn't have any packaged chemicals. So I knew this fellow up there. I said, "Look, you guys have got to get on the ball up here and to get with it, because the people out in the field are going to have to do their own processing. You can't send everything back to Chicago or Rochester for processing." The MS films were becoming available. I said, "Why do we have to send them back there, and why do we have to have all this complicated chemical mixing procedure and what have you? Why can't you send us the chemicals and let us mix them?" They said, "Well, we've never done that before."

So this fellow that I knew, and he had been at Kodak for a long time, he knew just about everybody there. So he said, "Come on up here, and we'll go see Mr. Streetmater [phonetic]," was his name.

I said, "What does he do?"

He said, "He's vice president in charge of packaging."

So we went to see this gentleman, and he said, "Well, we haven't done this, but what do you need? Tell me what you need." We told him. He said, "Well, if we were able to do it, in what lots or what size would you like?"

I said, "How about a fifty-gallon size?"

He mulled that over a while, and he said, "Contact me in a couple of weeks."

I contacted him in a couple of weeks, and he said, "We've packaged our first chemical in fifty-gallon lots. But we have a problem. We can't sell this to the government." There's one section—I may not have this exactly right, but in the NASA charter, I think it was Section 305B or something, which says that any company that develops anything under NASA contract must be made available to the public or something. So to them this meant that they had to give up their secrets of processing and chemicals and all this kind of good stuff. They didn't want to do it.

So, again, another hurdle, but there was another fellow I knew in the NASA legal department. I said, "We need your help. I've got a problem with Kodak. They can do something, but they can't do it."

So he said, "Well, let's go." So we got on an airplane and we flew on up to Kodak. We talked to their—he did, I didn't. He talked to their attorneys. They knocked this thing around for almost two days, how they were going to handle this thing.

Finally through their legal mumble jumble legalese and what have you, they came up with something and they ran it by headquarters and our headquarters in Washington, and they got a waiver or something where that section would not apply in this case. He said, "Now, to really clear this thing up, since we can't sell them to the government, do you know of anybody that processes film that could use these chemicals?"

I said, "Well, it just so happens that we're under a contract with Texas Industrial Film Corporation here in Houston, who has been processing some film for us when we couldn't do it."

He said, "That'll be fine."

So I called the owner down at the Texas Industrial Film Corp. and asked them to buy from Eastman Kodak one mix of their packaged chemical. So they bought it, fixed the chemicals, processed the film, and from then on it was all right to buy it, because the technical terms, I guess, was "reduced to practice." Once something had been reduced to practice, then they could deal with the government. So they go over that little hurdle. So we had to go through a contractor to buy our chemicals the first time. After that we bought [them from Kodak]. So there's all of these little things that had come up. They were all hurdles of one kind or another. Some of them serious, some of them were not.

Digressing a little bit, quite a bit, when Wes Hjornevik asked me to come aboard, he said, "I want you to go down to Houston. Ellington [Air Force Base] has a bunch of buildings down there. There's one building you ought to look at." It was the old commissary building that the Air Force had used. He had seen it. He said, "It's a good-sized building. It looks like hell, but maybe you can do something with it."

So I came down here and looked it over, and it had some of the things that we could use. For example, it had a large freezer area and cooling area where they kept all their perishables and what have you. It was about 10,000 square feet, as I recall. I went back, and I said, "Yes. I think we can do something with it." He said, "Well, go to the engineers and get the engineers on board."

So there was a fellow by the name of Marty Burns in those days. He was working pretty close to Wes Hjornevik in there somewhere. He was a real go-getter, and he was probably my first boss at the Manned Spacecraft Center. He could get a lot of things done. I went to Marty and told him what we should do, and he got his engineers on board and we drew out some sketches what the darkroom should look like and where the processors should go and all of this kind of stuff. I said, "How much of a lab do you want me to set up down there?"

He said, "Well, set it up and buy your equipment. Set it up up there, and get yourself in business down there in this laboratory. Then later on when we move to the center, you've got to move all this stuff out of here."

So that set up some more problems. You buy all this expensive equipment. He wants you to go into operation. Then you know in about eighteen months you're going to have to take it all out again. So the idea was putting knock-out panels on all of the walls going into all the rooms. All the equipment we bought, all of our processors, except for the real fancy ones, like the Fultrons and so on, everything else was installed on chocks. We went into business at Ellington, did our processing, printing, the whole business. When it came time to move down to the center, why, in the meantime they were building—Building 8 was one of the first buildings that put up here at the center, one of the first group. They also had knock-out panels and windows installed in that building, Building 8. So when it came time to move, in about two days' time they had moved everything out of the lab at Ellington and re-installed it down at the center.

So to back up just a little bit, all the connections and so on of our equipment, all the piping was done with the union joints so it was easily taken apart. So basically all they had to do was just uncouple these things, get a forklift to get under these machines which were on chocks, put them on a truck, take down here, and repeat the process and the installation, and we were back in business in about two days, which I thought was a wonderful effort by the people who really did the work. So that was the beginning of the whole thing.

Then we began to expand in Building 8 until it eventually got to be, I think we ended up having about 40,000 square feet in that building. We did everything from black-and-white film processing, from the little cameras all the way on up to some of the things I've already mentioned. It was all done in that one building.

But very early, even before we had moved onto the center, Hjornevik called me one day, and he was still down at the Farnsworth Chambers Building in Houston. He said, "I want you to get involved in television."

I said, "I don't know anything about television."

He said, "Well, you ought to." So we began to look around for some people who knew something about television. At that time there weren't too many people available. But I contacted some people in Dallas, one of the TV stations up there, to see whether they wanted to come on board. They looked everything over and said—don't what they said, but they didn't come.

Then we were doing some work at White Sands Missile Range in New Mexico, and we were helping with a photo installation out there. I heard of a fellow by the name of Jim [James C.] Stamps, who was in television, doing work with the Army, I believe, out there. He really knew his stuff. After talking with me, he decided he would join up with us. So we hired him, and he came in here.

By this time we were moving on to the center. Jim was a real whiz. We were also under contract at that time with the Taft [phonetic] Broadcasting Company in Houston, and we also had on board as a film contractor, we had Technicolor Graphics, Incorporated, was our other contract. It ended up Paul Taft [phonetic] came aboard as a contractor, I believe, in [19]'62, and at the time I left the center, he was the oldest continuous contractor out in the center, and one of the most cooperative people in the world. He just bent over backwards, and he had a lot of very, very talented people. With Jim's effort and with the effort of the Taft Broadcasting Company, we build the closed-circuit television system here at the center.

No one was really too cooperative in those days, as I recall, but we proceeded, anyhow, at Wes' direction. He said, "Well, hook up some of these buildings." So I think we hooked up four buildings on a Saturday, and since we were going to have the switching capability, we became the hub for the center. So all of these co-ax cables were installed in the tunnel system throughout the center, and it ended up we put in miles of cable. All of these cables were terminated eventually to all of the buildings out there.

Toward the end, by the time I left out there, television was becoming the major plan. It shifted from film to TV. You know from we've said and what you've read, that we got into the television business from a little black and white film camera, which I think Tom [Thomas P.] Stafford took. No, Tom took color. One of the other flights had a black and white camera. As a matter of fact, I think it was Gemini '76 [Gemini VII and Gemini VIA], that, those two, they took pictures of each other. No, the pictures were taken of [Walter M.] Schirra's [Jr.] flight. Remember, he held up the picture, "Send us your cards and letters, folks," or something like that? So that was the black and white.

The next time we went up, we had the color. And that was a very simple camera. It was built by Westinghouse, I believe, and a very simple system, but one that met the power constraints. It was a color sequence camera. I think that's what they called it, and the pictures were made in black and white and recorded on the film in rotation, the blue, green, and red filters rotating in front of the lens. Each one of them created a black and white image, with the idea that later on when you got the film back that you would reverse the process and project the light through the filters on our printers and recreate the color, reconstitute the color.

So what really happened here was that the signal was coming back from the Moon, whatever route it took, I don't know, Australia or wherever, and probably traveled 300,000 miles by the time we got it, from the Moon to the deep space tracking stations, to wherever it went, and finally got on some kind of cable somewhere and found its way here to the center through mission control, and mission control over to Building 8. We recorded the imagery, the black and white pictures, ran them through our process, reconstructed the pictures, and we made the color in Building 8 through the conversion system.

Then we transferred the color television pictures to film. It was all done there. I think I should mention here that all of the film and all of the TV, all the pictures that were taken, all the TV that was made on the lunar program, has all been put into archival storage, and any pictures that were made on color were again reduced to black and white, in red, green, and blue, because the color dyes have a limited lifespan, and they would eventually fade. It may take fifty years, but they'd probably fade. If you go to the black and white, it'll last much, much longer.

So all of it was taken from color to put back into black and white. Any particular frame or picture has three black and whites to it, a red-, green-, and blue-type picture, and it's all been put into archival storage right here, or it was, at the center, with instructions that any future generation that wants to reconstruct the color picture, this is how you do it. I think it's still there. I don't know what's happened since I left out there.

Here, again, we tried everybody that we knew of in the government to store this film, put in archival storage. You know, we never got any takers. We went to the Smithsonian. We went to some of the Air Force places that we thought would have archival storage conditions. Either nobody wanted it or they just didn't want to fool with it. So we have it, and it's put in a film vault.

It's temperature- and humidity-controlled, and I guess it's still there, which is the same thing that we did with the film that we bought from Kodak. We bought a very, very large length of film, and the film, like Kodak, they have a coating where the emulsions are put on a base, and it makes a strip of film, which I believe is about forty inches or forty-eight inches wide and 6,000 feet long. So we ordered a section of this one particular emulsion, and we had it cut into strips of, I think it was five-inch film, 70-mm film, 35-mm and also 16. Now, I don't recall whether we bought a whole coating, whether it was 6,000 feet long or not, but we bought a lot of it, to cover the entire program.

We wanted all the film to be of the same emulsion number, and the reason for doing that is that each coating has an emulsion number, and they don't record exactly the same in terms of color rendition and sensitivity and so on. They're very close, but they're not exact. So to ease our problem in reproduction later on, we bought all the film. The original film was of the same emulsion number, regardless of what width it was cut at. So once we put the sensitometry on the film, from the beginning of the program to the end of the program, it was always the same. It eased the problems of production a lot. We were after, again, the ultimate, what you can get out of a picture.

You say, "Well, why do you do all this?" Well, listen, the whole program was a one-time thing, and the responsibility that everyone had in doing this, after you finally go to the Moon and you come back, you certainly don't want to Mickey-Mouse the whole thing and not get the maximum out of it. Also, there are other reasons for doing it. In the event that something might have happened to the film, maybe exposure-wise or what have you, by knowing, having some good base information, you can have something to work from to help correct some of the mistakes that the astronauts would make in terms of exposure or what have you, which happened on several occasions, where the wrong setting was used and the film was overexposed by 1,000, 2,000 times. Rather than just say, "Hey, it's ruined," there were certain things you could do by having good base information. It enabled us to adjust the processing and, in some cases, make images out of something that normally would have been lost. They probably weren't the best in the world, but at least they recovered enough we could do something with it and it wasn't a total lost.

In terms of coping with radiation, well, that was going to happen regardless of what you did, or you could do some things in protecting the film while it was board the spacecraft, but once it was put in the cameras, if anything took place, why, you just had to live with it. So here, again, every piece of film that was ever put in a magazine on a camera had a duplicate strip in the laboratory with the sensitometry already on it, which meant that before the flight, and not just one piece of sensitometry but several. And before any film was ever put in a processor, that piece of film, which was kept in the lab, was processed and read out density-wise, color-wise, and we knew exactly how we needed to treat the original before it ever contacted the chemistry.

I must say that radiation, I don't think, ever was a real problem. Well, there may have been some very low base fog, but nothing that couldn't be overcome. Early on, we were concerned about the lack of humidity and having these cameras operate in near vacuum and what have you, but before the flights were ever made, these problems were overcome. They just kind of went away. You worry about them, and when you finally have an EVA or something like this and the camera's exposed to space, space environment, even though it was a short time, we know that the [film] didn't outgas and turn into chips and things like that. It just didn't happen. It just didn't outgas. So one by one, these things went away. So far as the lunar film was concerned, most of those things has already been put to bed before they got it.

BERGEN: We're at a point where Kevin needs to change the tape. So why don't we take a break. [Tape change]

Mr. Brinkmann, during the break you said you wanted to talk about some of the unmanned missions. So why don't you tell us about what you did.

BRINKMANN: Before the manned flights, there were three programs, and I think they were often referred to as the pioneer programs. The first one was Ranger. Ranger went to the Moon, and it had television cameras—I mean two sets of cameras. I think one pair used twelve-inch lenses and I think the other one used a focal length of about six inches or something like that. The idea was just to go there and gather some information to eventually determine what the surface of the Moon was like and eventually help to find some landing sites for the Apollo. There were several missions flown, and it accomplished what it set out to do. They got a great deal of information from it. They took thousands of pictures and sent them back to Earth.

But the second program, the Lunar Orbiter Program, is the one that was interesting to me. Now, we had nothing to do with that so far as our center was concerned here. Several of the people that I knew back at Langley were the people who were managing the project, I think, for the Eastman Kodak Company. What intrigued me about the Orbiter was that it used an onboard processing technique. It was launched. Just five missions flew. The idea was to take close-up pictures of the Moon, closer and in more detail than Ranger did. I don't know all of the details in it, but I can basically mention some of the things that the—and these pictures were taken in stereo pairs. The pictures were taken using image motion compensation technique. You know what that is, by any chance?

BERGEN: No.

BRINKMANN: Well, it's a technique where you have the film move at the same rate at which the vehicle's traveling over the ground, be it from air, be it from the spacecraft. I think they refer to it as V over H, which is velocity over altitude. So essentially by having the film move at the same rate that you're traveling over the ground, it's stationary. So you achieve the optimum resolution that way.

So these were all made in little framelets. After the pictures were taken, let's say the vehicle was on the dark side going around the Moon, what have you, the film was processed and it used a bi-mat [phonetic]. It's a damp process, a mono solution, I guess it is. The film is processed. Then it's read with a sensor. Then it's printed, stored, and eventually put back from the take-up spool where you've taken all the pictures. Eventually it's transferred back and reversed back onto the supply spool. Then the process is started all over again.

They were filed on a schedule, and by the end of the first three missions, the mission of the Lunar Orbiter was accomplished. So they still had two more vehicles to fly, and these, I think, they changed and put them in a more circular orbit. By the time the program finished, they had photographed the entire Moon. About 99 percent of the Moon had been photographed, and it was all done with this so-called bi-mat process.

We had thought for many years about onboard processing, especially when they got the astronauts involved and wondering how we were going to do the—one suggestion was made, you'd process the film on board; the other was that you brought it back. Several other things were discussed. But eventually I said, "Well, why not just take your pictures and bring them back and process them here. It's a lot simpler, and you get better quality that way."

The mission that followed Lunar Orbiter was Surveyor. Surveyor was designed to be a soft landing. It got to the Moon. It had a television on board. Well, it had other cameras. This was a soft-lander, and it was controlled from the ground. It had a variable focus lens and you could move it. So they took pictures all around there, all around the spacecraft, and they even scooped up some soil, I guess, for some kind of preliminary studies or what have you.

It is also interesting that Apollo 12 landed within five or six hundred feet of where the Surveyor was, and pictures that were taken by, I think it was by Alan Bean, you could see the Apollo in the distance and the Surveyor in the foreground. You know some of the other details of the thing, but, anyway, I thought it was very interesting that this should be done where you can see the whole thing, Apollo in the background and the other spacecraft in the foreground.

All of these were necessary. These flights were necessary to really give man a good feeling about going there, some degree of feeling that you weren't going to sink in there way out up to your ears in that soil. So we can take it from there.

BERGEN: Looking back over your career at NASA, what do you feel were your most significant accomplishments and things?

BRINKMANN: Well, probably what I've already said. To me, it was a personal thing, like I said, from early on to be able to first be involved with all the testing and so on, and then eventually to see a man put into space, put on the Moon and return. I've recorded in my little book that I made that I don't think that there are many people that are ever going to be able to live through the whole thing that I did, from the very beginning, my first flight at seven or eight or nine years old, whatever it was, and through putting a man, having seen and talked to and shaken hands with the people that went to the Moon, and the whole spectrum. I remember I wasn't seeing a lot of detail on Lindbergh's flight, but I remember what took place after Lindbergh's flight and all the fame that he achieved in his time and just went on from there and through to World War II days and all the aircraft that eventually were produced, and it just kept right on going right after that. The whole idea was to fly faster and farther than you did yesterday until it came to the Moon. So I feel that I've seen about all of it.

But I really believed at the time that we had completed the Apollo Program, that if it had continued on that way, that I would have lived to see a man on Mars. But that wasn't to happen, I guess because, well, there were many things going on. There was a lot of turmoil at that time internally, I guess, in the country and also with Vietnam and also the attitudes were changing a little bit toward space. After all, we'd been there. We'd done it. How many times do you want to it? And that kind of thing. So it was beginning to phase out. But

I think that if there had been a real effort to continue on the beginning, there might have been much more interest created in wanting to do it than after. Once it had all died off, it was pretty hard to recover from.

BERGEN: For generations that are to come, what would you like for them to remember as far as photography's role in NASA?

BRINKMANN: As far as me personally?

BERGEN: Yes, you personally?

BRINKMANN: Well, I would say it was this, that every picture that they have seen or will see, taken on the Moon, that we did, we handled and processed, everything, be it television, the still pictures, whatever, and that we were able to take this information and preserve it so it'll still be there for generations to come if they ever want to use it. It's there, and who knows when it'll ever be done again. The advances that have been made in photography since they went to the digital technique, it's just absolutely fantastic. Just think what we could have done with a simple little camera that we have today that you take your pictures in color, it produces sound. You can go directly to your video screen, put it on your computer. It's automatic focus, automatic this, automatic everything. Just think of what Ed [Edward H.] White [II] could have done if he had that on his maneuvering device, how much simpler it would have been. So there have been many, many advances. Film is almost gone. It's all digital and electronic these days.

BERGEN: Speaking of which, the work that NASA put together to preserve the space experience, how have some of those things benefited photography and the general public?

BRINKMANN: You mean the film that we've preserved?

BERGEN: The techniques or the film.

BRINKMANN: The techniques were not new. No, it's rather standard. As a matter of fact, the color sequence camera is something that you probably studied in high school physics. You pass a light through a red, green, and blue filter, and you have white. If you use the negative technique and use the other filters—I forget the combination. I think it's cyan, magenta, and yellow, if you pass light through that, you get a black, you can't say an image. It's not an image, but it's black, so it's subtractive colors is what I'm trying to say. These things, that's not new. You learned that in physics in school.

BERGEN: What were some of your favorite photographs or moments from your time at NASA?

BRINKMANN: Well, one of them I think we talked a little while ago, and it's one that's hardly ever mentioned. That's the picture that was taken from a command module, photographing the ascent stage as it approached the command module for docking. You could see it as it was approaching. You could see the surface of the Moon, and you can see the crescent of the Earth in the background. That was one of them.

The other one that is really amazing is the full Earth, which was taken, I think, by Apollo 17, of the entire Earth, the entire sphere which shows the Earth I think from the South Pole up into the Middle East somewhere. But it was the full globe, which is, I think, amazing.

Of course, Ed White's venture into space, I thought, was just great, first time we'd seen someone outside of a spacecraft, and, besides, they were personal friends. Just to see that.

By the way, I think you should mention the interest that was shown by our top management at the center. After every Gemini flight, now I won't say Mercury, because Mercury hadn't gelled yet. We hadn't gelled as a center, and things were being done kind of helter-skelter. But after Gemini, when we were organized and so on, after every Gemini flight, after every Apollo flight, Dr. Gilruth and Dr. [George M.] Low were present when the film came off the processors. No matter what time of the day or night, he had orders. He said, "You call me when you expect it to come off the processor because I want to be there."

On Gemini IV, I called and he got out there. I called him at home. He got out to the center. It must have been about two o'clock in the morning, and he was present when the film came from the dark side of the processor into the light, and it showed the first images of Ed White outside, and he just couldn't believe it. Every flight thereafter, they were there. Later on, Chris [Christopher C.] Kraft [Jr.] and Sig [Sigurd A.] Sjoberg. You know, having people that far up in management to have an interest made it a lot nicer all the way around.

BERGEN: Did you have any other colleagues that you worked with that made a certain impact on you?

BRINKMANN: Well, the first thing you do when you create any kind of an organization is to search for the best people you can get to do the job, and I was fortunate in being able to get a lot of people that were really, really good in what they did. The first ones on board I hired at Langley. They were Gene [Eugene G.] Edmunds, John [W.] Holland [Jr.], later on, Dick [Richard W.] Underwood, and, as I mentioned earlier, Jim Stamps. The people down in the lab, every one of them was picked up from an organization where they were the top people there. So we had a tremendous staff of good people. After everything was in place, my main job was just being there, I guess, and making the final decisions, but they did the work. Gene Edmunds, for example, was on every recovery of every astronaut, from Mercury through Apollo. And he had some experiences that—you ought to talk to him, too.

BERGEN: Okay.

BRINKMANN: Later on, Gene and I were there. Going back again, were the people who flew the T-38s, way back in the beginning of the program. So Gene was with me all the way through. And as a real expert in interpreting photography, you can't beat Dick Underwood. He just has a wealth of knowledge. So when you get good people, your job is easy.

BERGEN: That's true. You've talked a lot about Mercury, Gemini, and Apollo. We didn't touch on the Skylab or ASTP.

BRINKMANN: Skylab, to me, wasn't as interesting as the Apollo part of it. For the most part, it had been done. The base work had been done. But since they were going to be in space for so long, there was a really good chance that we'd have some fogging or radiation on the film and what have you. So to overcome that or help to overcome that problem, the film vault was built to store the film there while they were in space. I think the flights lasted as long as some eighty days or eighty-two days or something like that. So that was significantly longer than anything we'd ever had.

The film was put in this vault and, by the way, that film vault weighed over 2,000 pounds, just to store the film itself and to cope with the radiation problem. But here, again, sensitometry was placed on the film, all of it that was stored in the vault and in the cameras. As the mission progressed, we were more or less keeping track of it here at the ground so that we'd have a pretty good idea what kind of radiation the film was subjected to during the flight. Again, the processing strips or the control strips, as we called it, were processed first to see if we should change our techniques or what techniques were necessary to create good images. But the base fog never rose to a point where it was objectionable. That we knew we could overcome, or it was overcome.

I don't know whether all of the Skylab flights were launched at the same azimuth angle, but I think the launch was higher in latitude. I think it was launched at about fifty degrees, which took it in an entirely different orbit from the Apollo flights when they orbited the Earth. So more of the northern cities and country was photographed with Skylab. As a matter of fact, one single picture that I particularly liked because it had the entire state of Wisconsin on it. It was just beautiful, and we'd never seen that in the shots. The definition was really good, especially our larger cities. It passed over New York and Washington and some of the larger European cities. But the interest after Apollo was beginning to wane a little bit.

Now, as far as ASTP is concerned, that was an interesting flight to me, that Tom Stafford, the commander, was a personal friend, and Deke [Donald K.] Slayton hadn't flown yet, and Deke finally got a chance to fly. That was great, along with Vance [D.] Brand, and, of course, the Russians. It was after the flight, I believe, that the entire crew came over to the lab and looked at the film, including the Russian astronauts. So we got to meet them all.

BERGEN: Did you do any work with the Shuttle before you left?

BRINKMANN: The Shuttle was just coming in. As a matter of fact, the first Shuttle was brought, I think to White Sands from Palmdale, California, somewhere out there, and it was at White Sands. But that's about the time that I departed. So I don't know too much about the Shuttle other than what I see and read and hear like everyone else.

BERGEN: As you mentioned earlier, we have so many advances now, and now so many of these pictures are on the Internet. How do you feel about seeing this accessible through the Internet now?

BRINKMANN: These that are taken now, you say?

BERGEN: Well, and some of the older ones are available, too. On the Internet you can get to them so that the general public can see them relative—

BRINKMANN: All of those that are in storage?

BERGEN: Well, I don't know exactly which ones are all available, but I know many of them are.

BRINKMANN: If I read your question right and heard your question right, everything that has ever been taken is available to the public.

BERGEN: I'm not sure about that, but I know selected ones are available to the public now.

BRINKMANN: If it was made during the time I was there, it was made available to the public. Now, what they've done after that, I don't know. I can't say.

But, by the way, again, in going back a bit, there was such a demand for these pictures. The first ones, the Apollo 11, for example, you've seen movies that were made of the press and how aggressive the press was and you can imagine wanting to get these pictures in the hands of the public as quickly as they could. People were having some bad experiences with some of these people in that they would do just about anything to get their hands on the stuff.

The lunar rocks and the film that came back from those missions, the film was put in temperature-humidity-controlled boxes and sealed and locked, as were the containers containing the rocks. But when the aircraft that brought the stuff back landed up at Ellington, there were guards present all the time, from the time that the aircraft landed until the time that it got to our lab. Then when the film got our lab, it was locked, guards put outside the building. Same thing was true with the lunar samples that went to the LRL [Lunar Receiving Laboratory]. All that was handled in much the same manner.

You say, “Why do you have guards on a building when you have something as insignificant as a piece of film?” But as I just mentioned, the clamor that existed, the desire to get the stuff, they’d practically beat the doors down. So they just put the guards out there, and, of course, again, the message got through, “Let those people alone over there until they’re through with their work and then you’ll get it as soon as you can get it.” And we did. We got to them as fast as we could.

In the lunar lab, I think one of your questions was what did we did do in the lunar lab. Well, we had a man over there, and when the film came back, it had to be decontaminated. In order to expose the film to the decontaminant, I guess that’s what you’d call it, and I believe the substance used was—boy, this is drawing now, drawing back. I think it was ethylene oxide as a decontaminant. In order for the film to be exposed to this gas, the film had to be taken out of the lunar magazine and put on a set of rewinds and interleaved with a special kind of paper to create some breathing space between the laps of the film, to allow the gas to get in there to penetrate and to get a good kill on any microbes that might have been there. So that was all done, and, you know, it’s all done in total darkness, and it had been rehearsed many times.

So our man over there was Terry Slezak, and he was the first, if not first. the second person to touch lunar dust in that he inadvertently got some on his hands when magazine S, which was the one that was dropped on the lunar soil, and when he opened it up, he got his fingerprints, he was holding it up to the window. I've got that picture here somewhere, holding it up to the window. And, of course, the whole lab went, what did they called it, "hot." So he had to be doggone sure that everything was clean before they put these guys on it. I guess it was, what, twenty-one days that they kept them in there. So he literally lived with Armstrong and Collins and Aldrin. Yes, they sit right in with those people. He also participated in the testing whatever it was, the soybean mixture or something or other that was used to grow the mini-microbes or something here, during all the test stage.

Coming back to the film again, the film, after it was on the rewind and the new take-up spool was put in a—I think they call it an autoclave. Is there such a thing as an autoclave? And passed from one room to the other into where it was decontaminated and then passed back out again, they got it. Again, when the film left the LRL, under guarded vehicle coming over to the lab. But I guess it was all necessary. When you look back on it, you say, "Was it?" but I guess at the time it was. It was very important.

BERGEN: Is there anything else that you felt you wanted to discuss that maybe we didn't touch on?

BRINKMANN: I think I've covered just about everything. I know I skipped around a lot because I have a little trouble keeping it all in sequence, the way it happened, but I think that pretty well does it.

BERGEN: Well, we thank you for coming in this morning and talking with us.

BRINKMANN: Well, I hope we answered some of the questions.

BERGEN: Yes, definitely.

[End of Interview]