SAM BEDDINGFIELD JANUARY 15, 1994

TITUSVILLE, FL

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TAPE 1 (Field Recording #30, 31)

SAM BEDDINGFIELD: Okay, I'm a native of North Carolina. I was born in the town of Clayton, North Carolina, which is very close to Raleigh, the capital city. I went to school, elementary and high school, in the town of Clayton, a very small school of twenty-four (24) in my graduating class and I uh went to North Carolina State and studied Aeronatical Engineering uh breaking the family tradition, everybody in the family was medical except me. I was the youngest and I decided I didn't want any part of a medical world so I'd always been interested in aeroplanes and became an aeronautical engineer. And when I graduated from college I went to work for the airforce as a civilian in flight tests but I had to manage to get a ROTC commission with the air force and after about six months of workin for the air force as a civilian I they called me to active duty and I in essence replaced myself. I just went home and put on a blue suit and came back doing the same job and I did that for about three years and then uh...

Q: That was during the Korean War or...

SAM BEDDINGFIELD: No it between wars, between the Korean War and Vietnam Wars it was 1956 uh '59 and uh that was about time the space program got started so I left the air force and went to work for NASA at Langley uh went down to Langley originally just to see if I could get a job in flight research at the Langley Research Center but they didn't have any slots so they uh asked me to go over to talk to the what they call the space people and I didn't think like I knew anything about anything that didn't have wings on it but I went over and the first person I ran into over there was Gus Grissom who was one of the uh original seven astronauts and Gus and I had flown together in the Air Force so Gus kind of talked me into coming to work for NASA which was less than a year old at that point.

Q: But he wasn't an astronaut yet, was he?

SAM BEDDINGFIELD: Yeah.

Q: He was.

SAM BEDDINGFIELD: Yeah he was uh they had been selected I guess around May or so and this was about September and uh he talked me into oh made it interesting and

I went back to my North Carolina home and uh they called me on the phone and I finally agreed to go to work for em and I stayed at Langley. I was gonna try to work at Langley and then go home on the weekends so I could take care of the farm of something but that didn't work out. They sent me down to the Cape on temporary duty in ah September of 1959 and I never did make it back, stayed down on a permanent basis. This was uh to come down to really start Project Mercury here at the Cape.

Q: What was it like when you first came here, what was your impression?

SAM BEDDINGFIELD: Well the impression of the area was uh (laugh) different things gave you different impressions. The uh odor on the river was certainly a very impressionable thing especially here in Titusville. Uh the security was was very tight at the Cape uh they...we when I came down NASA had a little office down at Patrick and you checked in down there and quite a bit of rigamarole it seemed to me to get into the Cape area and uh NASA only had a part of hangar F, one hangar on the Cape was all of the facilities that NASA had at that point. We had the motopool consisted of one 1946 ton and a half truck that was the entire motopool you know and we started moving around and D. Merritt Preston who was my boss at that time said "Gee we gotta have some station wagons" and I told him I had a Hertz Rent-A-Car credit card. He says, "Good, go get some station wagons" so I had three or four station wagons checked out on my Hertz card. I felt the DAO folks would come get me any time but they never did (laughter) so that was how we started our motopool with just was rental cars and uh we had to get all of the uh not only were we worried about how to check out the space capsule we had to get all of the facilities and all the ground support equipment in place to start the project. In the meantime they were trying to launch some of the test (?) they had one shot called a Big Joe which occured just about the time I got here and then we worked on the mission called MA-1, Mercury Atlas 1 which was a production spacecraft chassis but none of the electronics were production and we launched that. We worked for a long time seemed like trying to get it ready and they launched that and it lasted 51 seconds and the rocket blew up (laughter) and it was raining terribly just terrible weather when they launched it and it uh it fell in the ocean and we got it back in about a day or so and got to examine the thing and uh apparently the adapter between the spacecraft and the Atlas boosters uh had failed structurally and that's what made it blow up.

Q: What um was it like out at the Cape I guess NASA had a little corner but was going on in the rest of the...

SAM BEDDINGFIELD: Well there was an awful lot of uh it was a big push to get the ICBMs and the um ballistic missiles working not only ICBMs but intermediate range missiles too and uh it was an impressive thing with the street names out there you have ICBM Road and IRBM Road and Heavy Launch Road they were very functional names for the streets and roads out there now and everything was centered pretty much around the uh launch control center, mission control center um and they call it it wasn't mission control center just control center, central control is what it was and uh that was where all the destruct system, the flight safety offices and range safety offices were centered but it was a very busy time we would we would be launching like three a day out the the we we the U.S. would be launching three rockets a day frequently. Uh which is quite a change from now when they say they need 48 hours just between each launch

and they didn't have anywhere near the computers then that that we have now I guess they had more people or something but ah the launches were very frequent and frequently very interesting because a lot em didn't work they were they would uh especially some of the newer machines and they had some spectacular explosions even some of em right on the pad and they didn't get off the pad so. That was a very interesting time to see the different vehicles uh that were going there was a very active Atlas program uh the Titan program was active uh the Thor intermediate range program was active Polaris was active and there was some em that you would always know what's going on they they called em by test number but everybody knew which vehicle it was and like the Polaris everybody went out and watched the Polaris cause you weren't really sure which way it was going to go when it was launched and uh especially after they they lit one and the second stage immediately lit right on the pad and the second stage fell in the Banana River uh right near the Hitching Post Trailer Park just in the town of Cape, what's now the Town of Cape Canaveral it it flew southwesterly (laughter) rather than southeasterly and uh hit in the river out there just beyond the trailer park. Everybody went out to watch the Polaris when it went (laughter).

Q: It's a would you, would you know the guys that were working on the different projects did they all um...

SAM BEDDINGFIELD: We knew a lot of em you'd see a lot of em uh you know where we got into we were all fairly young people the Jaycees was a big organization especially here in town and you got to know a lot of the guys through those kinds of organizations uh work-wise you didn't didn't get to see like the guys working on the Titan uh we'd be working on the Mercury spacecraft we didn't get to work together very much. The uh range support people, the guys that worked for Pan Am and RCA and Technicolor most people you got to see them especially a lot of the Pan Am people cause they were that was all the minor range support and you got to see those people but for white hardware people we really didn't intermix that much in the early days cause they were military programs and lot, frequently very classified and we were down with a supposedly unclassified program where we didn't have to worry too much about security but you did get to meet em out in the community some and there was in the early days here in town ah you had almost two cultures you had a the space people which was one culture and the Florida crackers the people who had been here which was another culture. And they didn't mix well at all uh in the early days they they uh some of the Florida cracker people who had been very influential in their community all of sudden were not influential anymore and there was quite a bit of hard feelings there for a while but that finally got straightened out. And it was uh the thing the area was growing so rapidly it was hard to keep up uh I know at one time here in Brevard County we needed a new classroom in school every other day, the population was growing that rapidly so it was very difficult for em to build the schools fast enough just to keep up with the population and it it was uh and a -you couldn't, there was not, the infrastructure was not here you couldn't uh you couldn't go shopping uh you couldn't go everybody had young babies and you had to go to Orlando to buy diapers you couldn't buy those locally uh the Sears store was a catalog store uh there was one shopping center, Byrd Plaza in Cocoa, that was the one shopping center, Byrd Plaza in Cocoa that was the shopping center and didn't have one on the beach, no grocery stores or anything so lots of motels and bars on Cocoa Beach but not uh no grocery stores.

Q: Well after a launch would or even after a work day would you all stop at some watering holes and...

SAM BEDDINGFIELD: Frequently there was some watering holes that were uh...see in the early days the uh Merritt Island was Merritt Island and it was not Kennedy Space Center at that point and uh out very close to where Pad 34 uh Pad 39 A and B are the shuttle pads, there was some pretty good watering holes along there one place used to be called the Blue Whale or something like that which was uh along oh Titusville beach which is uh just south of Playalinda Beach and there was some good watering holes to stop there uh the down on Cocoa Beach there was quite a few places down there the Mouse Trap was one of the ones that was known world wide. In fact the Mouse Trap burned and uh they were rebuilding the place and it was so popular with the headquarters people that we had to put a an item in the daily status report on the progress of rebuilding the Mouse Trap so they'd know (laughter) whether they could come down and visit the Mouse Trap or not.

Q: Well that was an important place for people to get together and...

SAM BEDDINGFIELD: Oh yeah it was an important place to go and I it's cause there was it was pretty uh the work was pretty tense you you were pumped up quite a bit when you couldn't make a mistake there was no books to go by and our generation certainly had a unique opportunity in that there wasn't anybody around to tell us how to do it. We had to write the book as we went along and today the the young engineers that are coming along got old guys like me to tell them well you can't do this or you can't do that and uh I don't think they have the same opportunity we did we we knew we could make mistakes but we couldn't make the same mistake twice and uh so that's uh that's a big difference.

Q: How would you feel when something you'd worked on for a long time launch and it blew up for some reason?

SAM BEDDINGFIELD: Well it was uh it was a big disappointment to have it blow up but the main thing was you learned something anytime something failed you really learned something from it. Uh the the biggest embarassment was if you ever had one the same failure twice. That was just unacceptable and so uh most of the time if you had it so that it failed and it was the first failure and you really learned something then it it was some consolation because you learned something but if you ever had it so that it failed twice that was no excuse.

Q: There was no penalty for failure as long as...

SAM BEDDINGFIELD: No there was no penalty for failure or anything and if somebody did something wrong you'd stand up and say hey I did it and we'd try to understand that part and that was it but uh it you really didn't want to do it twice though cause the the the peer pressure was almost (laughter) unbelievable if you made the same mistake twice.

Q: Well I heard that um nobody wanted to stop a countdown either.

SAM BEDDINGFIELD: Uh there was a great game of uh uh chicken I would call it in that everybody would uh wait for somebody else to call a hold cause you always knew somebody's going to have a problem and it was always uh who could wait the longest to call the hold uh especially between the range people the range support people the booster the spacecraft and then you got all the various system telymetry(?) or power or fueling crygenics uh and yes there was always a great debate about who was going to call the hold and as soon as somebody called the hold there was all kinds of people that had problems to fix but (laughter) you didn't want to call it.

Q: You'd be looking around the block house and...

SAM BEDDINGFIELD: Oh yeah, you were watching other people's consoles to see how many red lights they had going and it was a that was always that still goes on today (laughter) that's not anything new to see who's gonna who's gonna call the hold.

Q: Can't you do what a, a day would be like, a countdown day?

SAM BEDDINGFIELD: Well, (clears throat) a countdown day was not say one of the normal days out there especially like during Project Mercury ah. A countdown day would would start we'd the first thing we did to the spacecraft in a countdown day was we'd install the igniter in the escape rockets and we did that with just three of us everybody else was in the block house with the door locked and we would go put the...it was...I was the engineer and we had a um contractor technician and a NASA inspector and we'd go out and put this ignitor in the escape rocket and then check it electrically which means putting electrical current into the thing make sure the bridge wires were still proper and then hook it up to the spacecraft and then there was a ballast assembly that had to go on the top of that which is a steel thing that you had to put in with about eight bolts and uh that would be the first thing that you would do and once you got all of that checked then they would start checking all the other systems and as you get down later on in the count you'd start putting the uh propellants in the uh specially like in the redstone the uh alcohol would that was the propellant we used that that had been in there for days but then you'd have to put the liquid oxygen in and we were kind of casual about the liquid oxygen. Usually when they got ready to put the locks in somebody would mention well we'd better stop smoking now cause we were had a little room at the bottom of the gantry right there and everybody was sittin' around and then they'd say well the smokin lamps is out now so we'd have to quit smoking and it was pretty casual (laughter) about sitting right by the bird while they're putting the launch in that ah. In some of the safety things that we know a lot more about now were not as tight then as they are now and uh then the count would be a long count it would be...of course with the shuttle it's a three day count but they have different shifts of people to come in. We didn't have that luxury we we only had one crew and the count may be 24, 29 hours long and you worked the whole time and if you your system wasn't being worked on you'd try to go find some corner to crawl up in and see if you could nap or relax or something uh but other than that you stayed out there the whole time and ah...

Q: How many guys would be out there?

SAM BEDDINGFIELD: Oh, on the spacecraft uh we'd probably have less than a hundred and uh the launch vehicle may be but I would say the whole launch crew was probably no more than a 150 people uh the um it took more to launch the Atlas than it did the rest of them it was a bigger rocket and more complicated but ah it was not that many people compared to the hundreds it seems now we have to launch the bigger Saturns and shuttles. The uh I've got a picture somewhere around of what we call the pad crew and it's uh it must be 15, 20 guys and that's it for the Mercury out at the Redstone pad. So it it was um it was fairly small and everybody knew everybody else everybody was on a first name basis we didn't uh a lot of the communication system was literally just sticking your head over the side of the gantry and hollering rather than using all of the uh official intercom system.

Q: Well you had one not very far from the blockhouse was it?

SAM BEDDINGFIELD: No especially not at the uh Redstone pad it it was very close and uh...

Q: Explain, how far was it?

SAM BEDDINGFIELD: Oh probably no more than 300 feet uh had windows in the blockhouse too in the Redstone you could look out the windows and see the bird. In fact that was one of the things the lift off procedure was they would we had some of the Germans who had been around it enough that they uh looked at the color of the flam and if the flame was the right color (laughter) it got lost so...it just...a real judgement call there. Now in the um Atlas blockhouse you didn't have any windows because the Atlas was a lot more energy involved in the Atlas, much bigger vehicle and the only way you could look out at that was with periscopes and uh it was uh it's pretty tricky during the count on that cause it both of em the the ah they had big massive doors on the blockhouse and the doors would get locked when it got like the armed and destruct system and those kind of things and the door was sealed. And unfortunately the airstreams were outside the sealed door so that you had holes you had a hole after the door got sealed it really got to be sporting in there (laughter) so uh...

Q: I think it was the longest day ever when after they locked the doors and...

SAM BEDDINGFIELD: I don't remember because fortunately my job kept me outside, I was the pyrotechnics system engineer and I was back at what they call the roadblock and my job if the thing crashed was to go save all of the explosives so I didn't have to stay in in the blockhouse during the Mercury and Gemini flights, I was back at the roadblock. That changed later on with the shuttle days when we had to launch control center, I did get stuck in the frying room for that but during the early days we were back at the roadblocks which you had to fight off the mosquitoes and things but ah you weren't stuck inside (laughter) the building.

Q: If you were still pretty close to the, the pad even at that I mean you must have had some concern about safety.

SAM BEDDINGFIELD: Oh yeah well the ah the first first production spacecraft we tried to launch in fact that capsule is out at Space Port U.S.A. right now and it was on

ah what we call MR1 Mercury Redstone 1 and the uh when it the engines on the Redstone lit, the vehicle lifted off about two inches and then there was a relay race because of the way the tail plugs came out and it shut the engine down so the vehicle just sat back down and uh the escape system was being flown kind of open loop and it was looking for a signal from the engines so the engines had shut down which meant that everything was ok so the escape rocket fired its bolts that held it in place and then the rocket ignited and the whole escape rocket just took off and it had about 52 g's acceleration cause it had 52,000 pounds of thrust and it only weighed about a thousand pounds so it took off in a big hurry and we were back at the road block and didn't really know what went on eveything happened so quickly, and one guy commented
and said boy that thing's faster than swish and that was his first rocket launch; and one of the old mechanics who's been watching redstones and everthing else for many years, he says yeah but it's gotta come back down, so he crawled under a truck and the escape rocket did indeed come back down and hit about 300 feet from us. It went over 35,000 feet high, straight up and it came right back down between us and the block housing. I imagine distance wise to the block house, straight line distance is on the order of half a mile or something like that; but it did come back pretty close.

Q: That rocket had a series of problems didn't it? Didn't it shoot off its parachute?

SAM BEDDINGFIELD: Well yeah what happened it went right through the whole sequence. There was a sequencer in there and the spacecraft sat there and did everything it was supposed to do except one thing, which was very forturnate; it did not fire the retro rockets. If the retro rockets had fired that was right into the fuel tank on redstone and we'd a had a catastrophe explosion; but there was a switch in there which they use to call a quarter g switch and that was the arming thing for the retro rockets and that didn't get armed; but everything else, it dumped the peroxide like it was supposed to, the main parachute was deployed; we had a sensor in the parachute so if it didn't sense a load on the line, it would disconnect that parachute and deploy the reserve chute and it went right through the sequence did everything it was supposed to do except we then had the rocket sittin out there, not held down at all with a 63 foot parachute draped over the side wait (laugh) and fortunately the wind didn't blow, if so it would've pulled it over. The destruct system arm, the umbilical system was totally disconnected so we couldn't disarm anything so they finally decided the best thing to do was wait for the batteries to run down so we just absolutely shut the whole range down for over 24 hours waitin for the batteries to run down so we could go do something about it....it was uh (interviewer inaudible) - No. That was the - what happened, it was the redstone that was the problem, not the spacecraft, and we had eh eh two bunches of people there. We had the spacecraft crowd and you had the booster crowd and a bit of competition between the two and I know I went back out there one day with one of my with the escape rocket to install it again and one of the booster guys had some snide comment about my escape rocket and I quickly told him I said hey last time my rocket worked; what happened to yours? It was that kind of competition that went on all the time.

Q: There was uh, it was different though when there was a man in it, right?

SAM BEDDINGFIELD: Well, yeah, it was. We launched some Mercuries with without men in the em, of course. But then Uh, see, when you got to the point where you start puttin people in them, you were just a little bit more careful, I would think and uh of course the astronauts were just part of the crew that was out there. We we worked with em everyday. We were working with the crews all the time. You got a blinking light (interviewer - OK).
This is the escape rocket that I was talking about. This particular picture here is uh I treasure this because the original seven astronauts all autographed it and sent it to me unsolicited at the end of the mercury program; so, I keep this one on the wall. Don't do many on the wall, but I do keep this one. This is a good picture of the escape rocket and this ballast asembly is up here on the top. There's a called aerodynamic spike on the top and the igniter had to go into the very top end and on when the Mercury Redstone 1 mission tried, the escape rocket seperated here and the whole assembly took off and then the spacecraft sat there and went through all of its systems. The antenna can came off, the parachutes came of that, there was peroxide reaction control motors in there that dumped all the peroxide and fortunately the retrorockets down here in the retropack did not fire. So it it was uh we were pretty pleased because we got a good test out of it. The spacecraft did exactly like we had planned for it to do. but then we brought it back to the hangar and worked on it again and finally did launch that same capsule and that capsule is on display out at the uh Spaceport USA. That is the Mercury spacecraft that's on display out there.

Q: Tell us a little bit about each of the seven astronauts. I know you worked with them in various (INAUDIBLE)

SAM BEDDINGFIELD: Yeah they uh well they're all uh all all seven of em were real sharp guys that had uh each of em had a large ego, I guess is the best way to say it. very competitive with each other but supportive of each other but among themselves, they were very competitive, they would look for anything that would give em an edge over one of the other guys and they would they worked with the launch crews very closely, we uh spent a lot of time with them, especially some of the work that I was in where uh had to uh do a weight and balance and the spacecraft had to have the weight and balance the center of gravity etermined very precisely because the rockets, the retrorockets that I talk about, and then the separation rockets, which we called (inaudible) rockets had to fire through the center of gravity or the spacecraft may tumble. We just, for that purpose, we just considered the astronaut another piece of equipment and he had a part number and we physically weighed and determined what the astrounaut's center of gravity was so the and it was to make him fit into his helmet and the helmet into the contoured couch and everything, we even had em have their haircut the same way each time if it the time that we had weighed em if they had their hair cut three days prior, then we would want a haircut three days prior so that everything would fit precisely. We were probably way too conservative in most cases but we didn't know any better so we did it that way.

Q: You really didn't know what would happen out there?

SAM BEDDINGFIELD: No, uh, there was a lot of people that said people couldn't survive in space, that they would uh, the reentry stuff would uh kill people and there were a lot of G forces that the Mercury program we were running 6, 7, 8 G's . I don't

know whether you've ever flown with a lot of high G loads or not but that's not a very pleasant experience and most airplanes that you even fighter planes that you maneuver in, 4 o 5 G's is about all you do and you're taking that up the backbone and not this way. The expression we use was eyeballs down and eyballs in and uh we used uh there had not been a whole lot of research on eyeballs in G loads and there was some concern as to whether people would survive that or not so that that was one of the major goals of project Mercury - was just to see if man could survive in space and do some limited maneuvering. And then we went to the Gemini program and the Gemini program was very specific to see if you could maneuver a spacecraft and and maneuver and also rendevous. We had to do that in order to make the Apollo program work.

Q: Speaking of that reminds me of when the commitment was made to go to the moon, you were already underway with Project Mercury. Alan Shephard had flown so you knew .....

SAM BEDDINGFIELD: Yeah, we we had 15 minutes of manned space flight experience and five minutes of weightlessness was all we had when the President committed us to send somebody to the moon and back safely and safely was the word because that was uh you had to have it right but once you launched and went on the translunar trajectory, or practically just got into orbit, there was no rescue capability. You had, they were kinda on their own, on their own resources, and I think one of the most dramatic things in the whole space program was the Apollo 13 flight where the oxygen bottle did indeed blow up and the amount of work that was done in order to figure out how to get that back was a tremendous cooperative effort between the people on the ground all over the country, and the crew in the spacecraft. That was, the thing was practically redesigned during that flight and we were depending on one engine to make sure that it would fire to get the vehicle back in one piece. It was a very dramatic thing, probably the most dramatic thing that's happened in the space program. I don't know how much the general public understood just how critical that was but that was a very dramatic thing.

Q: When, when you were just getting started, you didn't know so much. All these, these astronauts, they were all ready to go though, weren't they?

SAM BEDDINGFIELD: Oh yeah. They were all test pilots and all of us that had been in the test flying business understood that there were risks involved, great risks, and uh I guess all of us that have been in the airplane testing business have had friends that's ended up as smoking holes in the ground and you know that's part of the territory. You try to, you know, you don't want that to happen but you it's all machined and you cannot make a perfect machine and uh it's unfortunate that you don't have much rescue capability with spacecraft.

Q: Escape route? (kind of inaudible)

SAM BEDDINGFIELD: We had uh, the the Mercury did have the escape rocket which would pull it all off in one piece and then open, and the the Apollo was built that way too. Now the Gemini had ejection seats in it and the ejection seats were not usable except on a very limited period of time. They, they just had a few uh seconds at the start of the uh flight and after reentry that the ejection seats would have been usable,

so it was a pretty exploring thing to to use that too. In fact, most of the time, if you used it you'd probably end up going through the fire ball of the exhaust.

Q: Yeah, I guess nobody wanted to use it?

SAM BEDDINGFIELD: No (chuckle) and you got 22 G's up your backbone that's eyeballs down, if you fired the ejection seat.

Q: When that commitment was made, it really put a time frame on things and all of a sudden there was a real big hurry to get stuff and they brought in a lot more people.

SAM BEDDINGFIELD: Oh yeah, the, the number of people working on Apollo ended up all over the country, ended up being about 400,000 people and it would, that would, as I said previously, then they need a new classroom every other day here in Brevard County as the population was increasing that rapidly.

Q: Did you have kids in school here?

SAM BEDDINGFIELD: Yeah, my kids, both of my kids were born here, and went through, all the way through high school and UCF; so they uh, they went, in fact, it was, the school system was rapidly expanding and my oldest daughter, who lived in this house, she went to Whispering Hills School for her first year, South Lake School for her second year, and Apollo School for her third year, and we never moved from the house; the school districts kept changing, and I got tired of that so I finally called em up and said, enough's enough, we're not gonna move anymore. (chuckle). So she stayed at Apollo School for the rest of her elementary. Ah, but, there, there was a big buildup of people and uh even before Apollo started, ah, in my case I worked very long hours, you know uh, a 12 to 15 hour day was certainly not an uncommon thing and my wife was new to the area and if the washing machine broke, she wouldn't know who to call or anything like that. And it turned out that one of the best sources of information in town was the guy that ran the gas station, Mr. Alton (inaudible) who ran an Esso station downtown, and uh she she quickly learned if she had a problem, she'd call Alton and not call me and he would tell her what to do (laugh) and so, or, or send somebody over here to fix the washing machine or whatever it was that broke. So it was very interesting as to how the the old Florida cracker community in the space workers started merging. It was an interesting problem and that's pretty much when it really started getting together was during the Apollo time.

Q: Um hum! They did build some more schools, and they built some more restaurants, and grocery stores came in, and....

SAM BEDDINGFIELD: Oh yeah. When I first came to Titusville, there was a I think 2 restuarants here. One of em's still here by the way... the Moon Drive In was here then and is still here now. That's the only one I know that's totally survived the whole time; the uh, all the others have been built since then and the one or two that were here then are no longer here, except maybe uh the, the coffee shop - Eula's coffee shop; that was here.

Q: What would you do for family entertainment on the weekends?

SAM BEDDINGFIELD: Ahh, we went to the beach a lot. The beach was certainly available and ah there was almost no parks or anything to go to so you, you didn't go to the parks, there was some very small parks; ah, and, a lot of weekends, we just worked, you know (laugh) There was not a lot of Saturday and Sundays off. We uh, a lot of Sundays off, a lot of people were pretty heavily involved in church activities, but all of this working did take its toll on the family life; there were an awful lot of divorces, unfortunately, that occurred during that period of time because people were just separated too much and there was a lot of ah, a lot of travel involved also. I, I realized during the Apollo Program that I had been going to Washington too much when I got off of the airplane and went out to the taxi and the taxi driver called me by name, I realized that I had been going to Washington too frequently, so I decided that I'd better start sending people, but it, it was ah, that took a lot of toll on family too, with all the traveling, because I, I would go from here to Houston, and from Houston to Los Angeles, and Los Angeles back to Long Island, the Grummond Plant in Long Island, and back to here, and do that once a week for about six months, so that, that was a lot of traveling.

Q: What was your job at that time? What were you doing - that was the Apollo Program?

SAM BEDDINGFIELD: Yeah, I was running the Systems Engineering Office and what I was attempting to do was to make sure we got a good spacecraft shipped down here cause frequently we'd have all these big meetings which would, theoretically, turn the spacecraft over from the manufacturer to the customer NASA and everything seemed to be in good shape when we got it down here, then we'd get a TWX about that long saying would you confirm whether the following EO's had been worked or not and you knew that was the open item (laughter) and all of the schedule was based on the fact that that work had been done; and after a couple of them getting shipped like that, I got tired of that so we went out and said, you know, make sure that when you ship it we know what work you've got to ship. So it was uh, and again, it was kind of a game and who's shift is it going to be on and unfortunately, we had to finish everything down here; we couldn't pass it off to the Mission Control people.

Q. They were passing their problems to you and.....

SAM BEDDINGFIELD: Oh yeah. They, they would ship it down with parts missing, tests not done, or if tests were done, not done correctly, and so but unfortunately down here is where it all came together and you couldn't pass it on to anybody else, so we always got blamed for slipping the schedules (laugh) (lady inaudible) laugh, yeah, but it was, and then in Apollo, especially the Lunar flights, you, nobody could slip cause you had there was only certain times of the month you could shoot to the moon and then if you missed that launch window, you had to wait until the next Lunar cycle came along before you could it, about 28 days, so nobody wanted to cause that to happen.

Q. Uh, during that that time, I guess, the first part of the Apollo, they were working on that first capsule and all sorts of problems were found. What was your involvement with that?

SAM BEDDINGFIELD: Well, I was, I had been the mechanical systems section chief and the day the fire occured I was scheduled to leave the operations engineering and move to the program office. The fire occurred on a Friday and I was supposed to leave working with the mechanical systems engineer and go to the program office on Monday. One of the jobs that I had that I carry with me was to be in charge of the emergency EVA working group. We were supposed to figure out how we would rescue or take care of the troups in an emergency and that was what I was doing at the pad that night - was waiting for the test prior to that to be over so we could practice some of our procedures on emergency EVA's and uh that that was needless to say a very traumatic experience because we found out that things happened so quickly that a lot of our rescue preparations were no good and had to change rather drastically what we wanted to do and we had to change even the design of our spacecraft in order to make em work. We couldn't get the hatch open; when the fire occurred, it was an outward opening hatch, no an inward opening hatch, I'm sorry, and a uh, when it pressurized, when the fire started, there was no way to get the hatch open and we ended up with the rest of the Apollo with an outward opening hatch and as it turned out that was a good thing to have because we did start doing some EVA's with that and it made it a little easier to do extra vehicular activity with the hatch that swung open. But, there was a safety consideration for a hatch that opened inward because the pressure kept it in place and you wouldn't worry about an inadvertent depressurization and the Russians had a hatch that came open during reentry about that time and they killed three of their Cosmonauts because the hatch came open. So, you, you, there was always a trade-off on safety on how you did it but I since I was in a transition from one job to another when the fire occurred I was just assigned to the investigating team to investigate the accident and my job was to take the spacecraft apart to be in charge of that and make sure that we didn't destroy any evidence while we were doing it and it took us about six months to do that before we finally got everything taken apart and the burned spacecraft taken care of. We, uh, we were concerned. That was when the Freedom of Information Act first came into being. Dr. Thompson, who was the Chairman of the investigating board, told me, he said Sam, I want you to put that spacecraft - we have to keep it for ten years for evidence, he said, but I want you to store it in such a way that it is difficult but not impossible to get to it. So we went up to the Norfolk area and found some buildings up there that they had been storing airplanes in and cut off about 40 feet of a building and put it on a barge, a metal building, and brought it down here by barge; we put the spacecraft in it, and sealed the ends and there was about a 3 foot by 3 foot door that you could go in and we filled the entire building with nitrogen, put it back on the barge and sent it back to Langley; and then we wrote a procedure that said if you want to go in the building you must have current Scot air pack training and the only place you can get that is at Kennedy Space Center, so they had to come down here and get trained, cause if you go in the nitrogen environment, you could drown and you have to pay for the nitrogen that's lost while we do it and I figured that was difficult but not impossible so, laugh, the spacecraft stayed there and after ten years I finally got off the hookl so I'm not sure where it is now (chuckle). There was some discusssion about bringing it down here and making a memorial or something out of it but I don't think that happened. Last I heard, the thing was still at Langley.

Q: I guess there were a lot of things that had engineering solutions not unlike the one you've described and trying to solve the problem, gettting all the elements together.

Uh, let's see. Talking about the Apollo missions (Sam: un huh); you mentioned the Apollo 13. You were here in the area when Apollo 11 went off.

SAM BEDDINGFIELD: Yes, I was working on Apollo at that time. In fact, right after we got the guys back to earth and they were recovered, I left on vacation and I had been on vacation about a week and I got a call to come back to work to start working on the space shuttle; so I did not get to follow the Apollo program, I did, we had dual duties there; we were doing some shuttle and some Apollo, but as the Apollo program started winding down, the Shuttle program got more and more involved, so I mostly started working on the space shuttle (laugh) 25 years ago, so then right after Apollo 11.

Q: It was about that time a lot of the guys who had been on the teams, Mercury, the Gemini, the Apollo, and there were more and more people all along but then you had to lay off a lot of people.

SAM BEDDINGFIELD: Yeah, we lost an awful lot of the guys, I, I, especially, you know, you gotta admire like some of the Grummond guys, because Grummond had the Lunar module contract and they had no other contract down here at all, and, and, like Apollo 17, they knew it was gonna be the last flight, but they worked just as hard on that as they did on the first one and then know when that flight is over, they were gonna be out of a job and it was all a direct result of the budget situation. Uh, the budget started getting cut really about 1967 is when the the budget started dropping off rather drastically and if you compared it all to some constant buying power dollar that it very rapidly got to the point where the budget was about the same level it was in Gemini and it stayed that way until about the time of the Challenger accident where it peaked up a little bit to fix the Challenger accident and has increased a little bit since then but nothing like it was in Apollo. Apollo was a program that was done from an engineering standpoint, done really correctly, where we, the technique that we used was to take each component and qualify that component in the environment it was going to see and then put all the components together and make sure they would work together. We didn't get a chance to do that on the space shuttle; we, that, that takes a lot of up front money to do and we didn't get the upfront money on the space shuttle so what we had to do was to put all of the components together and try to qualify something and see what broke and then go back and fix it; and that's a very expensive way to do it, especially with things like space shuttle main engines, when you may put it all together and have one line or something break, but it would then destroy all expensive turbo machinery and those kind of things. That was uh, if it works you save money but if it doesn't work, it really adds to the cost and schedules.

Q: So there were really different ways of operating?

SAM BEDDINGFIELD: Yes. The, in Apollo we practically had a sign chiseled in the sky "waste anything but time"; in the shuttle program, we had a schedule that we wanted to meet but we also had a design to cost. The designers were given a cost buggey (???)to design; everybody has to design to a weight buggey normally, but not only did they have a weight buggey but they had a cost buggey that everything was supposed to be designed to which was a new thing that had not been done, and everybody would try to cut every corner they could to get, to keep that cost within their assigned number.

Uh, it, I don't think that it made it unsafe it just was a different way to do it and was not, to me, as effective as the Apollo system.

Q: Isn't that the way they do with like production aircraft, things that they don't know what they're with?

SAM BEDDINGFIELD: They can kinda do that but when it's pushing the state-of-the-art it's very difficult and uh we really pushed the state-of -the-art in the Shuttle program especially in three areas, in the computer area and in the heat protection system, the thermal protection system, and the uh main engine, the propulsion system. The shuttle, space shuttle main engine is a uh about a 3,000 psi in lbs per square inch chamber pressure, where most rocket engines, the Atlas, Centaur, those sort of things, are only about 750 lbs per square inch a thousand, so its, it's uh a real advance in the state-of-the-art on how that engine works; a very, very efficient engine. Uh, if the uh engine in your automobile was as efficient as the engine on the shuttle is, the engine in your car would weigh about 3 pounds. So, it's a very efficient engine. And, and we had to really push the state-of-the-art in order t o get that on the shuttle, and the uh, the thermal protection system, the, the tiles, we had two or three ways we were trying to go on that and we (you got a blinking red light - yeah) (background conversation: about 30 minutes; we got a couple of minutes yet) -- SAM: OK. Alright. The uh the thermal protection system, we had two or three ways we wanted to investigate and we did not have enough money to thoroughly investigate all of em so we had to just pick one and the tiles seem to be the most promising so picked that one and we didn't get to invesitage the others like we would have liked to.

Q: So it was the engines, and the tiles, and the.....

SAM BEDDINGFIELD: And the computers. Uh, we uh, we had, the computers, we didn't really get to build as new a computer as we wanted to; in fact, the shuttle has up until very recently had some pretty lousy computers in it and you know a lot of the, the 767 aircraft that everybody flies around for an airliner right now has far superior computers than the shuttle until we managed to change some shuttle computers recently, but uh the shuttle computers, the ole AT101's were kinda antiques; they, they didn't come out of Noah's Ark but close. (Laughter)

SIDE B OF TAPE

Q: I know no day was typical, but maybe you could just try to describe what it was like, you know, when you got up in the morning.

SAM BEDDINGFIELD: Well, we, one important thing out at work was to always make sure that the coffee pot worked, and, uh, when you get to work and if something was wrong with the coffee pot, everybody stopped everything else to go fix the coffee pot, then when you get the coffee pot working, then you go do your other things, but there was no real typical day because it would depend on where you were in the checkout sequence to make that day special, and we didn't work on just one spacecraft at a time; we would have three or four of em, so it varied as to what you would do during the day even. But, somedays would be particularly difficult, like the Mercury

spacecraft had the heat shield disconnected and dropped down about four feet to make a landing bag so when it landed in the water, it cushioned some of the landing shock; and it was some very, very tight criteria as to what kind of gap there could be around the heat shield when it was latched up; and it was very difficult to get that balance like it should be and sometimes you would spend three or four days just trying to get the heat shield latched in place.

Q: So, it would be like two, three, four, five guys....

SAM BEDDINGFIELD: Yeah. And a lot of other people sittin around waitin for you to get through with that so they could go do their tests and you get very frustrated sometimes because it would uh, you'd get one side correct and the other side would be outa spec and you go adjust that side then the front side, the other side, was not outa spec, so there was a lotta that that went on, there was a lot of where you would get ready to test something and the guy right in front of you, when some component in his would break; he'd say OK, let's go get a new one and the new one, the new part wouldn't be there, and you'd have to wait for it to be shipped in from some vendor or the factory or something; so each day was different, uh, we always had a meeting in the middle of the day, kind of a status meeting and change board meeting where any change that was going to be made to anything, everybody had a chance to discuss it, so we would know when we were changing the configuration of something. That was kind of typical in the Mercury. In the Apollo it got to be a little bit more organized and we pretty well worked on one spacecraft at the time and the Change Board got to be, uh, there was more things to worry about in Apollo, especially, there was many, many more ground systems and facilities and those kind of things where Kennedy was really responsible for em and we had to make sure that if we changed something that it did not affect one of the interfaces as to how it would make the spacecraft or rocket different, so there was a lot of Change Board meetings that got very formal so far as configuration control, in fact, that's what we called em, Configuration Control Boards; and I ended up doin a lot of that especially during Apollo in the early shuttle days was runnin the Configuration Control Board, and uh...

Q: Would that be an actual board that had information on it or a board of people?

SAM BEDDINGFIELD: No, this was, it was a board of people. It was a meeting and, uh, we had representatives from all the directorates and all the systems in there. It was a very dictatorial type thing, though. My vote, I listened to everybody and everybody had a vote but nobody's vote counted more than mine. So, uh, I, uh, it was about the only way to do it, was to do it dictatorially because everybody always wanted to change. At one time we were launching the things within milliseconds of when we were supposed to launch it and everybody kept coming in wantin to change and it was no why should we change, we were launching within milliseconds. So, then they came in and said if we change this, we can save manpower, manhours and that sounded like a good idea. We were gonna save money. And then I got to realizing, we still got the same number of people here. Uh, we haven't really reduced any people so I said OK, I'll approve any manpower saving change as long as you bring me the man's name and badge number that's goin out the gate and that cut those changes out cause engineers are gonna engineer. Everybody wanted to change (laugh) the thing. It was working perfectly and, uh, so, and, from a mangement standpoint you had to do a lot of

techniques like that to drive your point across. Cause you just hated to set up there and say no, no, no, no all the time. So, uh, the thing was to try to do was to not get em submitted in the first place. It was a very formal process for changing things. It was, uh, you know, it was a very beauercratic system; you had a form you had to fill out and lots a people had to concur on it and then it finally got, there was a presentation at the uh Board meeting which says this is what we wanna do and why and how it fits into the budget. My job at that point was to try to keep a balance between the costs and the schedule and the performance because a lot of times when they want to change something it may not cost much money but it could affect the schedule which would throw things outa kilter and so my job ended up, being a systems engineering office, was to try to see if I could keep those three things in some kinda proper balance.

Q: The schedule was number one? You lost some time redesigning the Apollo spacecraft?

SAM BEDDINGFIELD: Yeah. Yes. We, uh, we, we spent a lot of money too redesigning the spacecraft. As I remember it the new hatch cost like $75 million so it was, uh, we, we lost some time but then we gained some time and there was rather innovative techniques where we did things like we wanted to. I remember there was a stack where we wanted to fit things and the second stage was late coming in and they just made a dummy second stage and we plugged that thing in so that we could test the first stage and the third stage and then went back and put a second stage in when we got it and caught up with that testing and there was a lot of innovative things like that to do. And, uh, I remember the Apollo 8 flight which was Frank Borman's flight, that was the first one that went to the moon with Frank and his crew and uh that was one that was fairly innovative. That was the first time we had flown a man on Saturn 5 and uh we flew him to the moon and uh we had no capability to land of course cause the Lunar module was not up to the same schedule that the uh Apollo spacecraft was working so we decided that the best way to do it was to go ahead and test the Saturn 5 to its ultimate and the Apollo and then catch up later with the Lunar module. As it turned out it was a very impressive flight. But it was a big decision to fly that thing during the Christmas holidays. Back during Project Mercury we were ready to launch John Glenn's flight or we thought we were ready like in December of 1961 and the President called up and said do not fly it during the holidays and as it turned out we scrubbed enough that it was late February before we ever got it off but we felt at one time schedule wise that we could have launched that in December which was an important thing to the launch crew cause that says we would then be flying in the same year that the Russians had flown see, so, laugh, as it turned out we didn't get to do it.

Q: What was the fear, that there would be a disaster?

SAM BEDDINGFIELD: That if it crashed that the uh consequences during the holiday season would have been too great. At least that was my understanding. I did not talk to the President about that one but (laugh) but President Kennedy was great for calling up and asking you what was going on. I, I got a phone call one time. I was out workin on the escape rocket and somehow in the blockhouse somebody hit the PA system and said hey will that escape rocket work and I came back with some smart answer like who the hell wants to know and they said the President of the United States (laughter) so yeah you really didn't know who you were going to be talking to on the phone.

Q: I didn't realize he took such an interest.

SAM BEDDINGFIELD: I didn't either until that day you know that was uh that was just before Sheppard's flight. He wanted to know would the escape system really work (laughter). It's gonna work you know and that was uh in those days the systems engineer was totally responsible for his system which was a real unique thing. It's kind of done by a lot of committee action now but it was a lot of individual basis. If you said it was ready to go people took your word and said it was ready to go. If you say "can't fly" everything stopped. Based on one person.

Q: Another thing that seems to have changed a lot is that, that uh, in the beginning your were writing a book and now there's a book two or three inches thick for each mission, huh? Procedure manuals, or....

SAM BEDDINGFIELD: Yeah. There are many standard operating procedure type books available now and that's...

Q: How are those developed?

SAM BEDDINGFIELD: A lot of em are developed based on experience uh and when any procedure is written somebody of course has to sit down and write it and then it goes through many, many reviews. You have lots of interesting people depending on how integrated the procedure is. If it's to check out just a widget then the widget people get together and talk about it and if the widget doesn't have to interface with anything else then that's the end of it but if it's an integrated procedure where lots and lots of systems are involved, flight hardware, ground hardware, crew might be involved, then the review process for that procedure is very long and very complicated. And we in going from Mercury to Gemini and Apollo we learned how to document things so that you didn't have a lot of trouble trying to go from one place to another. We had a what we call ICD which is an Interface Control Document and that was a very sacred document. You would that would be between like two centers between say the flight hardware and the ground hardware and we would define what the interface was gonna be and nobody could violate that interface. If you had to change the interface then it took a new agreement to change the interface so that both sides would work and uh that turned into an interesting process. In fact I got a call one time from the uh I got an interesting call from the Army one day who they were developing a new tank and they wanted to build part of the tank at one place and like the turret and the gun at some other place and we introduced them to the concept of interface control documents to tell em how to do that and we had quite a few interesting meetings with the Army to show em what we were doing with the spacecraft and they used that same technique to build tanks with (laughter). And I think that's some of the spinoff stuff from the space program. It's very hard for people to see a lot of the benefits because the benefits frequently are what I call second or third order benefits. Uh you can call up today and make an airline reservation pretty simply and a lot of the computer programs that are used to do that are the techniques for those computer programs were developed in the space program because we had to develop em and then you can take that technique and use it for something else. A lot of the reliability things are were developed. We had to know what they were. Some of those things are good and some of em are not good.

The uh as far as the consumer is concerned I think that we learned an awful lot of what we call mean time between failures. That is how long something is going to last before it fails. Like an air conditioning compressor. Well the meantime between failure on an air conditioning compressor must be about 61 months which is five years and one month so the the manufacturers can guarantee the thing for five years for 60 months and know with about a 95% confidence that it's gonna last five years but after that the probability of failure goes up pretty steep so uh and and I don't know whether that's good or bad for the consumer but at least the manufacturer knows and he can use it certainly in his salesmanship that I'm gonna guarantee this thing for five years and he knows pretty confidently that it's gonna last five years.

Q: When you were keeping track of all of the components coming together and at what stage each one was in the process, did you use computer programs or did you have lots of paper?

SAM BEDDINGFIELD: We had lots of paper (laugh) originally. The uh computers that we like in the Mercury program were very primitive computers especially today, you know, the uh the biggest computer we had wouldn't have the same power that my personal does back here now and uh the uh we did an awful lot of it with just paper. In fact, even through Mercury, Gemini, and Apollo, uh and into the Shuttle it's been an awful lot of physical paper rather than electronic. They're now getting around to the point where they can keep track of a lot of it with computer and electronics but there's still a lot of paper involved.

Q: When I think about it there must be thousands and hundreds of thousands of parts to keep track of?

SAM BEDDINGFIELD: There are many and the problem is that these parts change. You know you know you can have a particular valve and you get a program that's been goin on say as long as Shuttle has been goin on and the guy that makes the seal for that valve may go out of business. So unless you can find somebody else to build that seal to that original spec, then the valve has to be changed. So then you've got a different at least a different dash number or something you have to account for and you got a new qualification program. You may have to go back and requalify that valve because it's got new components in it. Then you have to keep track not only of how its made but what its qualification status is also and go back and see what all the spares are. How how many of em do you have on the shelf now that are no good.

Q: It takes a lot of guys to do that?

SAM BEDDINGFIELD: Yes it does. The logistics of a program that has been in existence as long as Shuttle, remember I've been working on Shuttle for 25 years, so Shuttle is an old vehicle and just the logistics of trying to keep all of that straight is one of the most all encompassing functions of the program. Just to try to keep the thing flying. There was that's one of the things in the Shuttle program that has been under funded rather severely and I think the classic example was we landed a Shuttle out on the KSC runway and they went out and took the nosegear steeing box out of the vehicle while it was still on the runway to go put it in another Shuttle so they could close up the front end and hopefully get it goin to the pad. They didn't have enough nosegear

steering boxes to even have a spare and so they took the one out of the one that had just landed and put it another one before they even got it off the runway. So (laugh)

Q: They were probably waitin for it to come in?

SAM BEDDINGFIELD: They were (laughter). And and you know the flight the spare parts or logistics world has been funded at about 15% of what it should be. There again you have to use some judgement on that. If you kept enough spare parts so that you never had to wait on a spare part, then you gonna end up with a lot of spare parts on the shelf you never use. Wasted money. So its its kind of a delicate balance and that's part of the kind of the non-glamorous part of the space program just in the spare parts business but its a very very important thing and the only time you ever hear about it is when the system doesn't work when you're out on the pad and they can't close the hatch because one bolt's missing and they can't find a new bolt. If they found a new bolt and just put it in you never heard about it. The only time you ever hear about the logistics guys is when their system breaks down.

Q: I think that's true overall in the program too becausee there's a lot of failures that are remedied before a bird is launched that nobody hears about.

SAM BEDDINGFIELD: Yeah. Okay.

Q: Can you tell me, you know engineers have their own sense of humor and these pad rats did too.

SAM BEDDINGFIELD: Yeah. We uh there used to be several things that we would do, uh, one of the ones that comes to mind right now is we'd take a hard hat and fill it up with freon and you'd be up you know a 100 feet, a couple a hundred feet high on the gantry and see somebody walking down on the pad surface and you'd lean over and say look out below and dump the hard hat. Of course, it looks like water coming down but about ten feet before it gets there it all evaporates into the atmosphere. Now we probably contributed to the hole in the ozone or something but (laugh) we uh that was a great joke was to dump freon and see everybody run to keep it from hitting em and of course it never got there. Did a lot of those kind of things. Uh we did we would uh take pictures of people with ultraviolet light and use black and white film and it ends up showing the skin pigmentation rather dramatically and those kind of things which were kind of fun to do and uh we didn't have a lot of time to do a lot of em but uh you would there was a lot of humor involved especially like when Al Shepard really his uh he was really enamored with Jose Jiminez, you know, Bill Dana's reluctant astronaut, and uh part of that astronaut routine is that uh he wants his crayons and so for Shepard, when Shepard came out to go on his flight, I had a box of crayons and gave em to Shepard just before he was gettin in the elevator to go up on his mission and uh the uh on Wally Schirra's Mercury flight, Wally was a great sports car enthusiast so we uh the hand controller had to have a locking mechanism in it so when the crew man got in he didn't hit the hand control and fire some of the lattitude control rockets, so normally you had a big just a pit pen that you put it in so we took the pit pin out and we went down to Jim Rathmann's and got an automobile ignition lock and substituted that so that we could and had a very fancy key that you could do, so when Wally got in, we told im Okay we've got this thing tuned up like a sports car and he took that ignition lock later on and

put it in his own car; so (laugh) we did a few things like that. Uh I can't think of any other specifics right now but there was uh it was not all seriousness.

Q: Well, when you work that hard you need some relief from the tension I guess. And that was true all the way up the chain?

SAM BEDDINGFIELD: Yes. It was always great fun especially when you would get like a new secretary down or something and you would tell her to look at that rocket out there that's got those black and white stripes on it and watch it at night cause if the lights shining on the top they're gonna launch it pretty soon. Of course, that was the lighthouse and it would (laugh) they'd stay up all night waitin for this rocket to go (laugh) and it's not gonna go. I'm sure you've seen some of the films where we've superimposed the rocket exhaust undeneath the lighthouse and launched the lighthouse and those kind of things.

Q: What would ya'll do with that film. I know it was called "The Lighthouse that Never Failed". When would people watch that?

SAM BEDDINGFIELD: At parties and those kind of a lotta a lotta times you'd have a party after a launch or something and then somebody would show those at at various paties and uh reunions, those kind of things. I have a film back there in my desk called "Our Toys Make Noise" and what it is is just one rocket after another blowing up you know (laugh) so but that's the title of the film "Our Toys Make Noise".

Q: Is it is it got a narration on it or is it just.....

SAM BEDDINGFIELD: No just a I don't think so. I think its ??? 16mm and it's data film you know that we have a lot of cameras on every time we launch something and somebody just spliced some of those together and made a little film strip on it.

Q: It's actually kind of ironic that ya'll would watch those for fun.

SAM BEDDINGFIELD: Yeah (laugh). Well, its its people are always asking you about em you know so we said Okay, we'll put em all together and let everybody see em. They uh every now and then some of the guys would superimpose things that we I remember one time we had a uh what we call a countdown demonstration test and over at the uh Control Center they were monitoring all the stuff on video over there and of course the countdown demonstration test, when you reach T Zero, everything shuts down. Well somebody had a video tape of of an Atlas and I think this was, it was either an Atlas or a Titan, and they they switched it over very quickly so nobody noticed the switchover and when it got down to T Zero the one on the video screen actually lifted off and (laugh) everybody in the Control Center was not expecting it to lift off so they all go barrelling out doors to see this rocket that they don't know about goin off because (laugh) the destruct system is not armed or anything else and they are gonna lose the rocket then they go out there and nothings going on and everybody laughs at em of course (laughter).

Q: Umm, I can imagine. There must have been some startled individuals.

SAM BEDDINGFIELD: Oh well they they always did something like that. You'd get a new Air Force officer in you know and who's really taking his seriously and you have to get him trained properly (laughter).

Q: Yeah, it uh, it must have been special. I, I remember hearing a story about uh procedure manuals. A guy, two guys were up on a gantry and they're working and you know following it step by step and Joe falls off the tower and the guy says "Wait, you forgot your procedures manual".

SAM BEDDINGFIELD: (Laugh) That's pretty true you know and then then especially it gets invoved in all of the everybody takes their job real seriously. I, I know I had an inspector one time that was um a particular task that I wanted done and he says "No. we can't do that". And I said "No, you don't understand your job". So we what we call a mission preparation sheet and you wrote that and generally one engineer would write it and another one would sign it and then when the work got done you would have one inspector, contractor inspector, would buy it off, and then the NASA inspector would buy it off. So, I, I was tired or something one day and I said "Your don't know what your job is. Let me explain". So I took a sheet and I said "take capsule 14 to the top of the 40 foot tower and drop it. I said now your job is to make sure that this capsule 14, the tower's 40 feet high, and we indeed dropped it. (Laughter) Cause the engineering signature says that's what to do. Uh, but fortunately, everybody didn't take it that literally and if we were gonna do something that really would break a spacecraft, anybody could blow the whistle.

Q: Yeah, I guess, the uh, when uh, in the early days if you didn't have a part or you needed something, wasn't there a certain amount of camaderie between the subcontractors?

SAM BEDDINGFIELD: Oh yeah. You could go borrow from other people. Uh, I know we needed an altimeter, a standard MA1 altimeter for the Mercury program and uh this was for Gus' flight, and somehow, we didn't have one and it was a great discussion about it and I knew I could go down to the Air Force and get one. So, uh, I just told everybody, "don't worry about the altimeter, we'll have one in there tomorrow". (laugh) So, went out to the Air Force and said "I need an MA1 altimeter" so we got one you know just right out of the Air Force stock and stuck it in the space craft and everybody says "where did you get that"? "You don't wanna ask". So, (laugh) cause we knew how much paperwork there would be too so we just finally got one and replaced it in their stock system so that all the numbers and everything matched, but there was a lot of transferring parts back and forth and a lotta cases, in the early days, if I needed a particular part, couldn't find one, I could go into the shop and make it; and uh a lot of the engineers would go to the shop and make the thing and and it's not you didn't do that too much in flight hardware, but especially in the ground support equipment and facilities stuff, you could just go do it. You don't get to do that today. There's, you know, there's people that that are supposed to do those kind of things and people that are not, so, but in the early days, if you wanted a part

(INTERVIEWER WENT TO ANOTHER TAPE???? BUT STILL ON SIDE B LITTLE MORE THAN HALF WAY)

SAM BEDDINGFIELD: Okay, this is uh, I talked to you about the size of the crew and this is pretty much the "capsule crew" down on the Redstone pad. Its the guys that were out on the pad and not the people in the blockhouse. There was uh probably about double this number when you put the blockhouse people in. And then over on the Atlas pad we have a photograph which covers everybody, the blockhouse bunch and the uh and the pad crew. As you can see there's quite a few more people there plus we when this picture was made we got some of uh we got a couple of the astronauts John Glenn and Scott Carpenter and uh some of the managers also got in the picture. But uh....

Q: I guess the guys with the hard hats work on the pad, hunh?

SAM BEDDINGFIELD: Yeah. The blue hats are the MacDonnell people, later to be MacDonnell Douglas, but at that time MacDonnell; and the yellow hats are the NASA folks.

Q: Allright, then what have we got here?

SAM BEDDINGFIELD: Okay, that's the uh that's the uh mission control when mission control was located here at the Cape before it was moved to Houston.

Q: So that would have been for which program?

SAM BEDDINGFIELD: Mercury program and the first couple of Gemini flights.

Q: Not too many people in there?

SAM BEDDINGFIELD: No, there wadn't too many people there. Of course, the systems were not that difficult to, (laugh) there wadn't that many systems in the spacecrafts really so. I don't know how many of these, this is uh, it's a picture of John Glenn in the simulator and this is a picture of me this is a uh actually not a real spacecraft, that's a mockup spacecraft that I had uh. We had a coop student and I couldn't figure out, he was assigned to me, and I couldn't figure out what to do with im so I had im go through the whole manufacturing process and build a full size mockup of a Mercury spacecraft, and then later on we had these two young people where uh students who had gotten some fantastic scholarship and I've forgotten what it was, and I was explaining to them what the Mercury spacecraft looked like and this mockup was a good way to do it. The guy that built that later on went to school, he got an engineering degree then a law degree and he's a patent attorney today, so (laugh). Okay, this one is taken out at the pad and then uh that was on the day that we erected the Redstone that Gus Grisson flew; in fact, that's me and uh this is Gus Grissom right here, kind of dark, you can't see it, and Paul Donnelly and I'm not sure who that is with his back to us but uh

Q: Looks like an informal conference there of some sort?

SAM BEDDINGFIELD: Yeah, we were probably waitin for em to bolt it down or something. Uh, see the booster people ran that and we were all spacecraft people so

we had to wait for the booster people to get their thing done before we could then bring the spacecraft out and use the space and bolt the spacecraft to the rocket.

Q: Have a typical pose, hunh? Kinda like to find three or four guys standing around?

SAM BEDDINGFIELD: Oh yeah a lotta times like that. Uh this particular one is a photograph of Al Shepard being picked up after his flight taken from the helicopter. And uh I don't think you can see this one but that's uh Ham in the back (Laugh) You can't even see him, he just blends in with the stairs.

Q: On his back or his way out?

SAM BEDDINGFIELD: That was his way back. Ham was alright. Enos was one that flew on a Mercury Atlas flight and uh Enos was a he was kinda mean; he'd bite ya; and the uh the funny thing was we flew that on and we were supposed to fly three orbits and after the during the second orbit a thruster was stuck so we decided to bring it down one revolution early so it did not land in the normal recovery area and they picked it up with one of the backup ships and they got the capsule on board the ship and everything and they there was supposed to be some medical data recorded and uh the uh they the chimpanzee was in a little capsule, there's a picture in here somewhere of the little capsule that the chimpanzee was in, they got that out on the deck and they got it opened up and the medical technician was supposed to be recording the data and the captain of the ship came up and said "young man, I guess you know the whole free worlds depending on you" and the corpsman promptly fainted. And while they were taking care of him the chimp pulled all the leaves off so we missed some data there (laughter). This is a weight and balance rig. That's where we had to do all the weight and balance on a spacecraft. It's a very complicated system of tooling bars and optical instruments that where you had to very carefully level it and and do a weight with load ??cells?? and calculate then where the center of gravity was gonna be at the time of rocket firing.

Q: The point being you wanted to go straight.....

SAM BEDDINGFIELD: We had to fire we wanted to thrust the extended thrust line to be through the center of gravity so it wouldn't tumble and this is that's what Scott Carpenter, the side of Scott Carpenter's spacecraft looked like before launch, Aurora 7. Uh that's uh it always came back with those things almost burned off. There's one in here somewhere. Oh here's the it's the famous peacock dinner we had. Uh Pete Foul(?) the uh general ?? film guy Phil Makoto here talked me and Gordon Cooper into flying some peacock feathers because he raised peacocks on the side and promised us a P Foul dinner if we could get some peacock feathers orbited and we did that and we made sure he gave us a proper dinner which he did and this is uh the table decorations with the P Foul dinner and then this is the gang that was there. Uh, unfortunately he didn't invite any of the wives and I never heard the end of it from my wife because she didn't get to go to the P Foul dinner but it was very formal, all the correct wines, french menu and everything. He had it all flown down from New York and we rented the one of the private rooms that they had at the old Ramon's Restaurant there at the 520 A1A intersection.

Q: Well ya'll look pretty happy.

SAM BEDDINGFIELD: Oh yeah. It was a very good party (laugh). Uh, I can't see em very good (Interviewer says these are pretty much the usual kind of things). That's me and John Glenn and you can see that's how the spacecraft stayed most of time, all wrapped up in plastic and everything so that it wouldn't get wet. It's you don't normally get to see it like that. That's some of the art work when we were planning Apollo and uh that one is that's a trailer I designed (laugh) that uh John Yardley said couldn't be built and we built it anyhow.

Q: Well, there was a lot of that building it anyhow.

SAM BEDDINGFIELD: Yeah. Here we go. I think that's also Ham. Ham, he he, that stands for Holloman Aeromedical is where the the name came from (laugh). And that's some more of the weight and balance and rocket alignment. See the escape rocket is in here and we had not only did we have to do a weight and balance, but the rocket had to be aligned very carefully also so that and uh that took a long time to do that. Uh, several days to get all the weight and balance and alignments done and you had to wait until the spacecraft was almost ready to go to the pad so that everything would be in it when you did that.

Q: So that was almost the last thing that happened.

SAM BEDDINGFIELD: Un hunh, before we took it out to the pad.

Q: But what if it wasn't balanced? I mean, did you did you move a little ballast around, or....?

SAM BEDDINGFIELD: Yeah. We would uh try to do ballasts or if we found out where the center of gravity was, then you could put little shims under the rocket and align the rocket to go through that center of gravity. We had to predict, of course, the center of gravity changed all during the flight as you used fuel and we had to predict where the center of gravity was gonna be at the time the rockets were to be fired. And, there's more of the same. This is the inside of the blockhouse down in the Redstone blockhouse and uh you can see there that there's a lot of the Macdonnell people in there who ran the racks and a lot of analog equipment, not much digital equipment, a lot of recorders where data was recorded on paper, not on, we didn't do a whole lot of tape recording of papers because we didn't have that much digital recording capability. In fact, that blockhouse is still there and still has the equipment in it. Uh, we restored the blockhouse like it was and it's if you go over there to the Air Force museum uh and you talk to the right people they'll take you in the blockhouse and you can see what it looked like. This is uh, there was a, there was a periscope when you got in the spacecraft, there was a, there was a periscope in there that uh it was the way you looked out rather than having a window. The windows were added later on and uh we felt like they needed some kind of tension breaker so when John Glenn got into his capsule to fly the first time, this was on the periscope so that he could see it and it says "It's you and me John, baby, against the world" and then "Friendship is here" because that was the name of his spacecraft, was Friendship 7. We had another time to...

Q: But wasn't there a story about this the uh the medical guys who were charting his heart beat notice something irregular and didn't know what it was until was like when he looked into the periscope? Did you ever hear that story?

SAM BEDDINGFIELD: No, I didn't hear that story. I, I uh, I know the medical people did monitor him cause they were hooked up, once they got in then they got hooked up but I'm sure he would have seen that before he got hooked up. But like Gordon Cooper, he went to sleep while we had a hold. He went to sleep and we had to wake him up and tell him we were gonna launch him. So he he was pretty cool (laugh). This is the one that was on Scott Carpenter's capsule. Scott use to go around with a little ukelele and sing the song Yellow Bird all the time so we uh we picked up on that and hid that on Scott's periscope when he went.

Q: Looks like the same artist did both of them?

SAM BEDDINGFIELD: Yes, I think a lady name Cis Bibby did it for us and she's also the one that painted the uh names on the spacecraft. That was all hand painted on there. And uh I think I got a picture of Cis painting..I think it's over here somewhere.

Q: What's going on in this picture?

SAM BEDDINGFIELD: Okay. this is uh there was some pictures that we were discussing and John Glenn, no John didn't drive around in corvettes, he had a chevrolet convertible that he drove around in and this is John and Scott Carpenter and there was some photographs that had been made, I think, of some hardware or something, and I finally caught them in a parking lot out at the pad and it was uh, we were discussing some technical problem. Uh and uh now that picture, that's me and Scott Carpenter and I was show..Scott was the backup pilot for John Glenn so we didn't want anybody to get totally surprised, so I was briefing Scott on what we were gonna have on the periscope on John's flight and that's what I'm showing him there. (Interviewer - he's smiling).

SAM BEDDINGFIELD: Yeah, he he thought it was funny. This one is a picture, you can see this is John Glenn's spacecraft which Cis Bibby had painted the Friendship 7 sign on there but just prior to getting ready we thought to launch it, of course, we had many holds, uh the State Department called up and said that we could not launch the spacecraft unless we had an American flag painted on it. And uh of course we had not planned on painting an American flag on it. We had the United States written on it in block letters but the State Department said that was not good enough and said you gotta have a flag on it before you can launch it. So I said OK, we'll see what we can do and I called up some paint manufacturers that turned up to be Pittsburgh Plate Glass Company had some high temperature paint, at least thats what they called it, because this area was about 700 degrees farenheit and I told em we needed red, white and blue paint and they weren't sure it could take 700 degrees and at that point, I didn't care. All I wanted was a flag on there so we could launch it. But then we uh knew that there was a lot of people who were heraldry experts in the country that we may not know so we had to figure out what the exact and proper dimensions for an American Flag was so uh one of the guys that worked with me, Harry ?? took about two days and finally came back and said I found it in the Cocoa Library and I know what the length to width ratio

of an American flag is. So he he figured that out and I said "now, what size flag should we put on the spacecraft" and he came up with a box of the little gold stars like the teacher gives you when you do something good and said why don't we use these gold stars and scale up from there. So that's what we did. We laboriously made the flag so that it would fit the stars at the right size and we painted a white rectangle and then stuck the stars on one at a time and masked it off and sprayed the blue paint for the blue field and then had to wait for that to dry and then mask on where the white stripes were and sprayed the red to get the red stripes in there, so the first couple of flags were done very much by hand. When they came back the whole thing was kinda brown but uh its in the Smithsonian today if you want to see it, but, laugh, the uh after about two flights we finally figured out how to make a decal and put on there, but the first one was a very expensive flag; and this is uh, I think we finally did this one mechanically rather than have an artist come out and paint it. That was Wally Schirra's flight Sigma 7. It's very difficult to paint that stuff on those shingles. The outside surface of the capsule was called shingles and its a metal called Renee' 41 which is a high temperature fairly exotic metal, and uh, it was hard to find a paint that would uh stay on it very good. And I think the rest of these are pretty much just standard photos. The book seems to have been used. There's the infamous flag after we got it painted. These are some recovery pictures and we always got some uh I don't know whether you can see that one or not but we had a literally a dummy and we used to use that in the uh mockup capsule. There was an old spacecraft that we kind of filled up with foam rubber and put a head in it and uh but it was very light weight and we used to carry that thing around and somebody caught me carrying one day. You can see how casual we were. I was walking along with a coffee cup in one hand and a astronaut slung over the shoulder. We had a lot of fun. Actually, after the Mercury program closed down they were gonna throw a lot of that stuff away. That was before we had visitor center, Spaceport USA, set up and so I brought a lot of it home and this astronaut was brought home and the kids promptly named him Junior for some reason and Junior went all over the neighborhood. All the little girl scouts when they had a girl scout program, I remember one vivid image I have is about six little girl scouts carrying Junior over their head going across the street to take him over to somebody else's house. But Junior ended up back out at the spacecraft when they finally started the Spaceport USA, or visitors' center, I took a lot of the stuff that I had collected back out there so they could have some artifacts to use. I don't know what really happened to Junior. I haven't seen im.

Q: (Laugh) Almost a member of the family?

SAM BEDDINGFIELD: Yeah. This is the reunion stuff. Okay. This is a picture of the lady that actually painted the uh name on the side of the spacecraft. That was not something that we had considered early on in the program, and then the crew decided they would like to name the spacecraft and uh we did paint it on uh Alan Shepard's flight and Gus' which had flown first but the environment was not nearly as great and we just kinda lettered those on with block letters and we wanted to do a little bit more elaborate for this one and so we used some of that famous high temperature paint and uh got one of the girls down on the range who was an artist; her name was Cis Bibby, and got Cis to uh paint this on here for us so that that's how the Friendship 7 got on there in kind of script writing rather than uh block letters like you do with masking tape and a spray gun.

Q: She was also the one who did those periscope pictures?

SAM BEDDINGFIELD: Yes. She was the artist for drawing the uh pictures we used on the periscopes. And this is a picture of I got an opportunity to shake hands with President Kennedy and this was on the the trip that he came by shortly before he went to Dallas where he was assassinated.

Q: What was the feeling around the space center after he was shot?

SAM BEDDINGFIELD: Aw, it was uh a great deal of sorrow there. I, I ,I don't know how to describe it. Like everybody else in the world, I remember exactly what I was doing when we heard about it. We were heavily involved in the Apollo program at that time. In fact, we were discussing whether we needed a what we called a uh MSS mobile support structure or a fixed arming tower and there was a big discussion and a meeting going on and somebody broke into the meeting and said that the President had been shot. Ah, and there was uh, the the place just kinda shut down for a day or two. Didn't get much work done.

Q: Was there some concern that maybe things would not continue as before, but you knew Johnson was gonna....

SAM BEDDINGFIELD: No. We didn't I, I don't remember any sense of the fact that it would affect the space program in any way. It was just a really bad that the President, any President, had been assassinated.

SAM BEDDINGFIELD: This is the shot of the Redstone blockhouse and I'm pretty sure this picture of it was taken from the gantry. As you can see, it's a, it's a quite a small blockhouse and it even has windows in it. They were very thick windows though (chuckle).

Q: Guess so?

SAM BEDDINGFIELD: Yeah. So why don't you hold just a minute and let me find another picture in here. OK. This, this is a engineering sequence of pictures and you can see there was a, in the escape rocket there was a jettson motor also that had to fire and we fired ended up firing both of em. The jettison motor and the escape rocket and when the Redstone shut down, it gave a signal that says OK, I'm through with the escape rocket so the jettison motor fired and then the escape rocket fired and then there's a series of pictures here where you can see just how the thing took off. Uh, and we used these for engineering data believe it or not, in that uh, you can see some pieces right there starting to fall off and what that is is part of the clamp ring that held the uh escape rocket to the top of the, it had some cables that was supposed to retain it and we found out the cables were not strong enough so as a result of this, we learned something from it and had to beef up those cables. You can see where that rocket took off very quickly. It was 52G's acceleration so this was very high speed cameras taking these pictures and it went all the way through its entire sequence. You can see the uh antenna can beginning to come off there where the ?drogue? shoot was deployed and the antenna can came off and then after the antenna can came off, then the parachute

starts coming out and you can see the peroxide being jettisoned. So the spacecraft went right through its uh its sequence. There's the uh main parachute coming out. Main parachute and uh it came out and uh did not deploy so the uh this is the uh antenna can with the drogue shoot and the drogue shoot did deploy. The uh main parachute did not get any load so the reserve shoot came out also and that, that was the whole sequence of the pictures there and then this is where the escape rocket came back down. It, uh, it hit about 300 feet from where we were back at the road block.

Q: Looks like pretty wild country out there?

SAM BEDDINGFIELD: It was. We had to you know we had to watch for the rattlesnakes and things like that when you go out there.

Q: Is that still true?

SAM BEDDINGFIELD: Yeah. Very much so. They had uh, a one that crashed, you know, a rocket that crashed one day, and it drove all kinds of rattlesnakes out and the guards were goin around shootin em you know, to kill the rattlesnakes, but the fire drove a lot of em out (laugh). I got another picture in here somewhere. These you wanna cut... There's another picture of this..... that, that's the pad....

Q: Which, which pad is that?

SAM BEDDINGFIELD: That's pad 14. That's Mercury, Atlas program. I don't remember which mission.

Q: Once again, yellow hats are NASA?

SAM BEDDINGFIELD: Yeah. Yellow hats are NASA and the blue hats are McDonnell.

Q: Guess everybody had to wear a helmet out there?

SAM BEDDINGFIELD: If you were on the pad, you were in a hard hat area so you had to wear a hard hat. Did you get that? These are the guys that did the weight and balance on the Mercury spacecraft. Uh, I was the only NASA one there and all the other guys were McDonnell but uh when you got into a test like that you really could not tell the difference so whether some guy was a NASA guy or a contractor guy cause we all worked together. It was really a team effort.

Q: Pretty young team?

SAM BEDDINGFIELD: Yeah. I, yeah, somebody thirty years old was old. (Interviewer: That's true).

SAM BEDDINGFIELD: OK. I need to find that other picture.

....LONG SILENCE ON TAPE HERE....

Q: I get the feeling that you know, now the book's been written, it's, maybe it wasn't as much fun as used to be back then. What do you think?

SAM BEDDINGFIELD: Well, I think it was, it was a lot more fun in the early days

....TAPE ENDED HERE.....