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**Dr. Hans Mark Interviewed by Gerald Haines
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Gerald Haines: Okay, as I explained earlier, let's go back and we will pick up your early life, education, and so forth, and background, and then we will move into how you got involved in this business, and then we will move into your directorship, and some of the questions and major concerns you had there. Let's go back and start with your birth, parents, I know that you were born in Germany. Dr. Hans Mark: I was born in Germany, but I am an Austrian, I'm a VIENNESSE and both my parents are VIENNESE. My father was a professor of chemistry. He stimulated scientific interest, very early on. When the Germans invaded Austria in 1938, we escaped. H: Are you the only child? M: No, I had a brother who died some years ago. H: Older or younger? M: Younger brother. He was a professor of electrical engineering at Princeton, at the time he died. He was a long time member of the faculty there. We wound up in early 1941 in the United States, and after going through Italy, Switzerland, France, England, and Canada at the beginning of World War II. We lived in New York. I went to high school in New York, and then joined what was then called the (V-12) it was a Naval training officer candidate program at the University California at Berkley. After a few months that became what was then called the HOLLOWAY Plan which was then turned into the Naval ROTC. I spent 4 years in Berkley. H: This would have been when? M: I got there in '47, and in '49 by the way the Navy decided they didn't need any more officers. We were coming down the very steep slope, and half of us were let go. So, I just spent half the time in that program. The highest rank I ever reached in the Navy was midshipman USNR. I went from Berkley to MIT, and did neutron physics. Interestingly enough it was on a project sponsored by Admiral RICKOVER or then Captain RICKOVER. It was a jointly sponsored atomic energy commission Navy program. What we did was to measure the neutron cross-sections for the reactors that were being put on the nuclear submarines. We had a good bout doing that. I spent 4 years at MIT. H: And you would have been what age then? M:

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Well, I was 22 in '51, so I was 26 in '55 when I got out. I got my PhD in '54 and then spent a postdoctoral year. Then, I went to work for EDWARD TELLER at what is now the Lawrence Livermore National Laboratory. H: What was that like? Working for Teller? M: I worked there for 13 years. Almost 14 years there. It was interesting. I saw him 2 weeks ago when I was visiting Livermore. I still consult out there. He is now 89 years old, and doing well. I worked primarily on diagnostics of nuclear explosions. Developed some instrumentation for that. I got into the space business interestingly enough because in a test series in 1962, and 1963, just before we signed the atmospheric test ban treaty, we had a test series in the Pacific. We did some high altitude explosions. There were 3 or 4 of them. I remember the code words were, TEAK Orange, and Starfish. I remember we had a rocket launch site in Kauai on the Hawaiian Islands. The thing was launched on the THOR missile from Johnson Island. We would simultaneously launch rockets from Kauai, and watch the radiation come out of the device. I worked on things like that, and we also developed some diagnostic techniques for underground explosions, in fact our group was the first to measure the x-ray yield, or the x-ray spectrum from an underground nuclear explosion for an enhanced radiation weapon, which at that time was a big thing they wanted to do. I was head of the experimental physics division at Livermore from 1960 to 1964.

H: Did you get married in that period? M: I got married in '51. I've been married for 46 years. I also made a fundamental mistake; I married a lady who is much smarter than I am. H: Where did you meet her? M: As an undergraduate at the University of California at Berkeley. I should have mentioned that. We were married in January '51. We drove across the country. That was our honeymoon trip in the middle of the winter, to get to MIT. I was supposed to show up there on February 1st, so we got married on January 28th so we had 4 days to make it across country. I was head of that division. We had several hundred people. One of the things about Livermore,

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was, we were all very, very, young and we had very responsible jobs. I was 31 years old and I was my division leader. Harold Brown was Director of the lab, and he was 2 years older than I am, so he was 33. Johnny Foster was his Deputy, and Johnny was about 35. So, we were all in our early thirties, and of course there were no experts on nuclear explosive technology at the time. We were the cadres that came in. H: Any political innings at that point? M: Political innings? H: Interest in politics, or anybody that you knew that was doing politics? M: Harold Brown moved to Washington to become Lyndon Johnson's "____". The answer to your question is, no. What happened was that Herb York, the first Director of Livermore was the first DDRE essentially. First, he was Director of ARPA, which was set up then. Then, he was the first Director of Defense Research and Engineering. He was the initiator of that title. Herb was Director of Livermore from '52 to '58. He got the job under Eisenhower. I showed up at Livermore in '55, so that was halfway through Herb's tenure as Director. Harold was one of the division leaders when I showed up at Livermore. He then became an Associate Director, or Deputy Director to Herb. I guess there was a short period when Teller was Director, because they didn't want to give the job to someone who wasn't thirty yet, or something like that. Edward was Director for about 2 years, and then Harold became Director, and he left after a year because Herb had a heart attack and had to leave the DDRE job. So, Harold became the second DDRE. But, none of that was political. I mean we were on those jobs because we were experts on nuclear weapons, and Harold and Johnny were designers of nuclear weapons. My expertise was the effects of the weapons, and the diagnostics. During those years I ran the experimental physics division. We spent a lot of time in Nevada and also in high altitude diagnostics to develop the techniques to measure what comes out of the weapons. H: Were you aware of the early satellite programs, Corona? M: Yes, of course. The U2's became operational in '56. I showed up at

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Livermore in the summer of '55, and almost the first thing that happened was I got briefed on the U2 and what it would do. That was just about the time they had their first flight. H: '56 was the first fly over the Soviet Union. M: No, '55 was the first test flight. It took about a year to straighten out the cameras, and make everything work. That was a result of the KILLIAN LAND Committee, the U2. That U2 was intended as an interim between the ground zero, which was March '54 when the KILLIAN LAND Committee was set up, and the time that satellites would be available. It's interesting, that is of course where Gary Powers was shot down in May of 1960, and the first Corona, I think it was a MIDAS version, flew in August of 1960. H: The first successful one, right? M: That's right. Three months after Powers got shot down. That committee had it just right, that the airplane would eventually be shot down. At the same time, I had a faculty appointment with the University of California at Berkeley. I was a professor of nuclear engineering, and I got that in 1960. In '64 when I left the division chief's job, I was made department chairman there, but I still spent a third of my time at Livermore. So, although I was no longer division leader, I actually did more technical work during those years on things that had to do with what comes out of nuclear weapons. Those were the years when the Chinese did their first bombing. We saw all those pictures that have not been declassified on Corona. We would get weekly briefings on all that stuff. I was familiar with the satellite reconnaissance program when it started in 1960. I remembered Joe CHERRICK coming to Livermore and telling us about what they were going to do, so I've been in the business since year one. In 1969, I had the opportunity to join NASA and I came to the conclusion that there was not much left to do in the nuclear weapons business, in terms of making militarily more useful bombs. You could jimmy the yield up a little bit, you could fool around with emissions neutron bombs, and things like that, but I felt that what was important had been done. So it was time to go do something

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else. I had been with the University of California since '55, and this was '69, so it was 14 years. My wife said, let's move. So we moved from Berkeley to Mountain View where the NASA AIMS research center is located, and I was Director there for 8 and a half years. We did several things that had to do with National security and defense. It must have been '70 or '71, Kelly Johnson the designer of the U2 and Ben Rich his deputy came to see me. They had this very strange looking airplane model, that had corners on it, and it was the first stealth airplane. They showed it to me, and said will you do some wind tunnel tests on this thing, and so I said, sure, you're a government contractor and we are obligated to do that. We did some wind tunnel tests. I told Kelly at the time, I remembered an airplane designed according to Maxwell's equations wouldn't fly very well. Kelly's reply was classic, he said, you hang a big enough engine on anything and it will fly. We did that, and the other thing that is very strongly related to national security and coming to fruition as we sit here, is that we did what came to be called the airborne laser lab. That was putting a high intensity laser on a KC-135, to do the fire control problem, and the systems engineering and all that. Again, we did the wind tunnel testing on that, and it was critical because the airplane had to be stable. But, more importantly, wanted to learn what the effects of the boundary layer would be on the laser beam. We established that you could in fact shoot a laser beam through an airplanes boundary layer without getting it distorted too badly. We had several Air Force Officers working with us at the time at AIMS on this. It was a classified program so we had fences around everything. Interestingly enough the stealth program was not classified. Those models were made in the open area. H: Is that right? M: Oh yes. It was funnier than hell, because when I got to the Pentagon, Bill Perry briefed me into the classified program and I said Bill, what is classified, we started this thing 10 years ago? I got to the Pentagon in '77, and we did those tests in '70 or '71, so it was not quite 10 years, but I had been familiar with it for

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a long time, because of the early work that Kelly had us do on these things. AIMS was a nice period. We did lots of interesting things. We also did work on the space end of the business. Probably the most important thing we did was, we had the responsibility for developing the thermal protection system on the space shuttle. I became very familiar with the space shuttle program very early on. We had the prime responsibility of the thermal protection system. That was very " _____ " because Lockheed, Sunnyvale was the contractor. They were right next-door. Because I still had all the tickets, I got to know _____, and all the people that were building classified satellites at that time, at the same facility. Bill Perry had his place right next to Lockheed. _____

_____ We did that for them at AIMS. We did all the calculations, and the tests. I was really very well primed, by the time I got to Washington. I was in on the start of the shuttle program in '72. In fact, I have a letter in my file. Jim Fletcher, who was the administrator asked every center director to give him a letter discussing the technical readiness to go to the shuttle, whether we could do it. I still have that letter. H: What did you think of the shuttle at that point? Did you think this was the way the United States should go? M: Absolutely. The notion of an aerospace plane, which is what the shuttle is, is the right way technically to get people back and forth to space stations, and things like that. When we proposed it for the first time, the space station actually went with the shuttle. It was a single program. Then, Nixon said we can't afford to do the 2 of them. Then, we were forced to make the choice which on to build first. So, we said, the shuttle is technically more difficult, and it will be the pacing item in this whole thing. So, we did the shuttle first. Technically the thing is a real success. Financially it's not. In an advanced technology program like this, the costs are always very difficult to see, 15 years before you start operating it. It fell to

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me of course, to start operating it when I was deputy administrator of NASA. That was another interesting twist of fate. We did the shuttle, and then in 1977, I got a telephone call from GENE FUBINI who was working for Harold Brown at the time. I had known Harold from Livermore of course. H: Is this a small cadre of folks or what? M: Yes. In December of '76, I got the call from GENE right after the election, right after Carter got elected. Bill had just been made DDRE, which later became UnderSecretary for Research, Bill Perry. I remember we were both in Washington one day, and he told me he had been given that offer, and he said what should I do, should I go do it, or not? I said, of course do it. He said, Oh it's going to cost me a lot of money and all that, because he had to sell ESL, TRW took it over. They finally decided to do it. Two weeks later, FUBINI calls me up, and says do you want to come and be the Director of the NRO? I came to Washington. I said sure and that was it. Jim FLUNGER was my predecessor, and he had just resigned to go back to Lockheed. Charlie Cook was Acting Director. Even though I wasn't nominated until March I think and not confirmed until July in '77, because I knew all this stuff. When FUBINI called me, my wife again said, time to move on. She said, you've been here for 8 years and let's go to Washington. The kids were out of the house. Both of them were in college, so we didn't have to worry about moving a family. In the spring of '77 I began to work at the NRO. Because I had the tickets, and because I was very familiar with what was going on, even though I had not been formally nominated or confirmed, we already "_____."

H: And your offices were in the Pentagon at that point? M: I had an office across the hall from the UnderSecretary from March '77, and I think I was nominated, that is right; I got the office when I was nominated. I had already been to see Charlie prior to that. I was confirmed I think in June or July, but I don't remember. H: This is a strange agency, and you say you knew PALMER and Charlie Cook, but when you actually took over, and you had these parts, what was your

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impression? M: Of course, I knew the basic structure of the place. I knew Program A, B, and C. I knew the Air Force program better than the others, because of the pictures. Actually the pictures came out of the CIA, but I was a member of the Air Force Scientific Advisory Board, so that really during the Agency years, my connection with the program really came through my membership on the SAB. We would get the briefings on everything, and that was the way I kept in touch at the time. I got to Washington, and the overall and Stan TURNER became DCI, so H: Did you know Stan before? M: I knew Bob INMAN who was opposite number at NSA because I had sat also on the DIA Technical Advisory Committee, and Bob was deputy at the DIA at the time I was on that committee. I was pretty well plugged in with all the people that were in that administration. H: Were you a Democrat then? M: Yes. One of my major character flaws is that I am a Democrat. It is a character flaw. Franklin Roosevelt waved the immigration requirements for us to get into this country late in 1940, and he's a Democrat. It's that simple. I served in the Regan administration for almost 4 years, and I remember being interviewed by a couple of young lawyers in the White House when I was nominated to be Deputy Administrator of NASA. They were 2 young kids, probably from Yale Law School or something like that. They looked at the nomination pick and said, you're nominated for a presidential appointment, and you were Secretary of the Air Force, and they said Democrat? I said yes. They said why are you getting this nomination? I said I don't know. I told him the story. He said whom did you vote for in the last election. I said, you really know that is none of your business, and if you guys don't want me, I am perfectly happy to walk out of here and go do something else. I put it on the table and said: this is crazy. I've been asked to do a job, and if you guys screw around with politics, it is not a political job. The administrator of NASA is the technical administrator of the agency, it happens to be a presidential appointment, but it has nothing to do with partisan politics. If you make it

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partisan politics, I won't have a thing to do with it. That is where it ended. Anyhow, I got the job. The political environment that was critical was the intense desire on the part of President Carter to get SALT II approved, or to finish the negotiations, and then get the senate to ratify it. From the point of view of the NRO, of course that was the opportunity really to expand the program, because we knew that the Senate ratification process would require us to be able to get up and say yes we can monitor and verify. It turned out to be in the end, a very complicated technically sophisticated treaty. The issue of whether something was encrypted or not was a big one. On the imaging systems the difference between a nuclear capable airplane and one that couldn't carry nuclear weapons, these were all small things, so you had very high resolution imagery to see the different things. I went over to ACDA, Arms Control Agency, I think even before I got confirmed, and got to be very, very close friends with SPURGEON KEENEY. SPURGEON was Paul VARNKE'S deputy. In those days, Paul was the head of ACDA. SPURGEON had been in the Air Force. He understood technology, and understood the programs, and had all the clearances of course early on. I told him, I said, you know if you guys really want to get this thing through, then you are going to have to support our initiatives when we get them to Congress. Really the groundwork for expanding the program was laid in the early months of '77 because of the policy to do SALT II. The upshot at the end was that we ran the budget up from a

Remember the success of administrations and the Congress had informal agreements, which as long as the budget of the NRO stayed below a billion dollars, no testimony, no questions, just go right through. We broke that I think in fiscal '78. H: You actually made the argument that in terms of real dollars, the budget was "DECLINDED323". M: I made that argument too, but the real argument was SALT II. I mean the real political driver for that was the ratification of the treaty, and the more capable, well I can get into details of the system in

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a minute, but politically that was the thing. KEENEY was very, very, helpful there. David Aaron, who was Deputy National Security Advisor in the White House, was exceedingly helpful. SPEEK BRAZINSKI I had known much earlier, because my father was instrumental in getting him out of Poland, years and years ago in 1945 or '46. In fact when I was an undergraduate at Berkeley, I remember that he and a friend of his by the name of OTTO HITTMYER, I had already started to date the young lady I was going to marry. BRAZINSKI and HITTMYER stayed at their house for a month. I told her these are my buddies, and let's put them up. We had a grand time, driving around California. It must have been '49 or '48, somewhere in that neighborhood. We were all very young at that time. SPEEK was important, and David Aaron was his deputy for this kind of stuff, so I worked a lot with David on the SALT business. That was the political drawback. There was high inflation, it is true that we were beginning to replace some of the older systems, and so that was another argument. I believe that in my testimony, I didn't make a big point of SALT II because it really wasn't my job. I was not on the policy end of it. I felt that the best thing to do would be to make the other argument, but in private conversations, with Mary Faga, and other people on the staff, I let them know that I thought the real issue was SALT II and the president's desire to get it through. H: Any problems in the confirmation hearings? M: No. STENNIS was at that time the chairman. That is also a funny story. He was in good shape still. He was a very courtly gentleman, and there were three or four senators coming in while we were waiting, and he would turn around and look at them and say John how are you feeling today, and meanwhile I am sitting there waiting to get questioned. One gentleman, I don't recall his name, had an alcohol problem, and he came in a little bit shaky, and this was ten o'clock in the morning. STENNIS was particularly solicitous to him. So after this colloquy goes on between the senators, STENNIS finally comes to me and says okay son, what

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do you got on your mind? I said Senator this is the first time anyone has called me son in years. Thank you very much. Then, he started asking questions. You know, where are you from, so I said California. He said why do you want to leave California? I said, well, I am not sure I really want to leave California; we'll probably go back. Then my wife pops up in the back and says, you're right we're going back to California. And that was it. No controversy at all. It then got down to the technology end, and the personnel situation. I was blessed with the fact that the three program heads, LES DIRKS, in Program B at the CIA, JACK CULPA in Program A in California, and GROVER YAUHL in Program C here in Washington, were all first class people. So, I told them very early that no changes would be made. The headquarters staff was weak. Charlie Cook especially was someone I didn't think was up to the standard necessary for acquisition. We created a job for him. He was the chief of staff when I came in. I'm sorry. No, there was somebody else that was chief of staff, who would have to be moved out. I was the one who made Jimmy Hill chief of staff. H: I was going to say, that Jimmy thinks that was a mistake. M: It was the best move I ever made. He was this agency for many years. [REDACTED]

[REDACTED] I'm doing Charlie injustice because it was not Charlie, it was someone else. Charlie was deputy and he stayed in that job during the two plus years I was in. It was another one who had to be moved out, and I can't remember who that was right now. But we moved that individual out. I put Jimmy into this job. I remember I took him out to lunch somewhere and I put the proposition to him, and he said I can't do this I'm a technical this and that, and I said no, you can do it. H: He said the hardest part of that was to deal with the military, since he was a civilian. He didn't think it was right. M: That's right. He was worried about that. Then we went into the programs. In the case of imaging, we had the large photographic satellite. HEXAGON was still flying. [REDACTED] had just come on line. H: So, HEXAGON was being flown by A at

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that point. M: By Program A, and [REDACTED] had just come on line for Program B. The decision was made to phase out HEXAGON. We had a few birds in the barn that we were going to fly, but we weren't building any new ones. So that decision was made. Because of SALT II we decided to upgrade the thing with a [REDACTED]

Also, to substitute for HEXAGON, [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] of that, which had been very, very effective in military for monitoring the Korean peninsula and things like that. The issue of the [REDACTED] came up, and there was an intense competition between A and B over how that should be done. LES DIRKS who was the head of Program B wanted to put the [REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] You fly more than one bird of course, but you would produce them in such a way that all of the data trains would be the same. That was to me technically an attractive idea, and also financially it was an attractive idea. Because the claim was you could do it cheaper. Program A of course was very unhappy about that and so I said look, why don't you guys do something that ties you closely to NASA. Having just come out of NASA I knew what the situation was. I said why don't you take advantage of commonality between NASA and what the NRO is doing. JACK KOPA took me up on that, and I bought into GARWIN at the time to consult with us, on how to do this. You had one proposal from the CIA which puts everything on one bird, and you get commonality that way, you have another proposal which uses a separate thing for it, and you would get

commonality by working it that way. H: But the Air Force and KOPA don't want a damn thing to do with [REDACTED]. M: That's right. But, they want to have [REDACTED]. They want to get into the imaging business again. So, there motivation was to have an imaging system in Program A. H: It's been said that you suggested the shuttle business to drive KOPA to try to save money. M: I suggested the shuttle business to create a competition between LES DIRK'S idea, which was to put all the [REDACTED], and another idea for saving money, namely to work with NASA. The shuttle wasn't really the key. [REDACTED]

[REDACTED] H:

[REDACTED] M: Yes, that's right. Hs: Which they didn't want to use [REDACTED]

[REDACTED] either? M: No. [REDACTED]

[REDACTED]

So, one system would gain economic advantage through commonality on the spacecraft, and the other one would be commonality with NASA. I was very anxious to use the shuttle, because I thought that was the right way to do it. I remember in those days the shuttle program called for 5 birds rather than the 4 that we built, and it was much more robust than what we finally came up with. H: The proposals were for 22 flights a year. M: And that we would keep a hot production line going and that we could build new birds and replace them and all that. So, it was a different program from what we finally wound up with. H: What about the issue that the shuttle was in trouble at that point, and that you saw that it was in trouble, and if you could merge the two than you would have a healthy program? M: Merge what? H: [REDACTED] KULPA or even the [REDACTED] business with the shuttle and get the military involved in the shuttle, then

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you could save the shuttle part. M: I was very anxious to get the military involved in the shuttle because it was in fact the most capable launch vehicle that we were building at the time. Remember that TITAN 34-B was not as capable as the shuttle and that was the thing that was coming in the military. I always kept TITAN 34-B as a back-up, but I wanted the primary launch vehicle to be the shuttle. It had to do with capability of the bird. The things that we have done since then, you know repair on orbit, and check out on orbit before you deploy a satellite and all that stuff with human beings I thought was a very valuable capability to have. My military friends don't agree with that to this day. The shuttle was in financial trouble in 1980. The person who really pushed through the shuttle program was Harold Brown. I went to Harold, I said, look we have got to have this shuttle for military applications. We have committed [REDACTED]

[REDACTED] shuttle launches. In both cases, volume was the issue because the [REDACTED] were big on both of them. It wasn't the weight. The vent existing ELDs, the expendable launch vehicles could not carry either [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] it was funnier than hell. So, the shuttle was very important, and it was Harold who went to the president and got the billion dollars necessary to rescue the shuttle program. In fact, I was there at the meeting in the cabinet room. There is a picture put in the book I wrote on my Washington years of Frank PRESS who was the science advisor, myself, a couple of other people meeting with President Carter to persuade him to put the billion dollars into the shuttle program. That was late in 1980, in fact it have even been after the election. Carter did it. I think it was before the election, but I am not

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sure though. That was the reason for doing it, and I was very anxious to have the military take advantage of the human capability in orbit to check out satellites before you dump them, then later on to repair them on orbit. You know, we were going to launch satellites out of the west coast so that you could repair and fix polar orbiting birds too. H: You really took them kicking and screaming? M: Absolutely. It was funny to watch them. It had to be done, because of the capability inherit in [REDACTED] and we would have had to compromise our capability if we had to fit those things into the existing launch vehicles. H: They would tell you that the redesign costs for the shuttle is what drove the cost of those satellites up. M: You know, that's certainly true. But, had they designed the goddamn things for the shuttle in the first place, it was there fault that they had to redesign it. Because, they said we'll never go on the shuttle, and so when I got there I said sorry fellas that's crazy. You deliberately compromised capability that you could have, because for reasons I don't understand you don't want use this launch vehicle. That is how things evolve. Harold Brown was the one who believed what I said, and then went to persuade the president to get the shuttle out of it's problems. The shuttle was in fact sized to launch HEXAGON. The size of the PAYLOAD BAY was determined by HEXAGON. H: Which was a large load? M: It was a large spacecraft. HEXAGON was a compact spacecraft compared to the [REDACTED] In fact that was a very interesting thing. It was GARWIN who suggested that we use a [REDACTED]. NASA was developing [REDACTED] for their satellites and I can't remember which ones, but it was GARWIN who suggested that we use that [REDACTED]. I went to see Harold Brown, it was Stan TURNER'S decision to make, but I wanted to consult with Harold because he was a technical guy. I said I'm coming to see you as one technical fella to another. I had 2 proposals. One is to put all the stuff on one satellite, and the other is to make a separate

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[REDACTED] They were about equivalent in costs give or take, so there was no discriminator that way. I leaned toward LES DIRK'S proposal because of its technical elegance. It was an elegant solution to the problem. Even though I was a NASA guy. I had been in NASA. NASA benefited greatly from having that common system because they could then say we're helping national security and all that. I actually leaned toward the Program B suggestion to put it [REDACTED]. I talked to Harold about it, and we spent about an hour discussing it, and Harold finally said, look politically it would be a better idea to split this. You keep the Air Force on board by making the [REDACTED] an Air Force program and also if something does go wrong, technically, then you have all your eggs in one basket. So we decided to go with COPA'S program. Don KROMER in fact was the program manager at the time. H: What about selling Congress on it? M: That was a bit of a problem. There were people in the Congress who were very unhappy about breaking the [REDACTED] thing, you know, why do you need all this and so on. H: Particularly who? M: I'm trying to think. I remember one hearing, I think INMAN and I were there and Stan Turner, three of us. The question was could we monitor the telemetry. It was a hearing of the foreign relations. Glen was on foreign relations, and I remember that CLAYBORNE PELL was in the chair, and he was the quintessential New England gentleman, new nothing technical, and wasn't interested, and he was interested in ratification of the treaty and that was Stan Turner's, as the director of Central Intelligence he was the lead witness, and it finally came to me to talk about the technology. I had brought with me some printouts, which I had put on the wall, long paper charts. In those days we didn't have computers with alphanumeric screens, we had paper strip charts. I had them taped up to the wall in the committee room. When the chairman of the committee said show us, how are you going to do this Dr. Marks, I showed them the strip chart. I said see here is a telemetry signal coming

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through and we can decode it this way and that way, and it was a classified hearing. Of course on the strip chart there was noise. There was electronic noise also. When it came John Glenn's turn to question me, he started picking up these little noise squiggles. He said, Dr. Marks tell me what that squiggle is, and so I said that's noise Senator. How do you know? I said well, Senator you've been around the space business, I mean you flew in orbit, that is noise. Oh, I am not sure that is noise. We kept going back and forth on that, and I started talking about noise theory and the SHANNEN equation and all that stuff, and finally pavloved out. H: It was too much for him? M: Yes. Finally Glenn, was the only Senator left. The whole thing was between me and Glenn on the question of how you could tell noise from signal on a chart like that. What we did have in the Congress, was that the committee staffs were very, very good. Marty Faga was, later over here, was very instrumental in getting the things through. And there was another staffer whose name I don't remember now, I think who also came out of the CIA, who was also very helpful in expanding the program to the [REDACTED] level, we finally got in fiscal '81. This issue by the way, was over [REDACTED] that was being used to [REDACTED] was the issue. We didn't do anything with [REDACTED] although I know that was upgraded later on, but we didn't put any money in that. We had [REDACTED] and then we wanted to have a payload on the shuttle, to use the shuttle as intelligence bird. The idea then, and this was CULPA'S idea, was to modify the last HEXAGON, to put in the payload bay, and to be something that you carry up, and then bring back. H: Is this [REDACTED] M: Maybe it was [REDACTED] I don't remember the code name. That was never done, as you know. Of course as soon as I left the Pentagon, and went over to NASA, we had nailed down [REDACTED] as shuttle launchers, [REDACTED] did not need the shuttle because it was a compact

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although heavy, payload, so it could be put up on the TITAN. I don't think we ever launched a

[REDACTED] No we didn't because that was a [REDACTED] Where as [REDACTED]

[REDACTED] orbit. I remember it wasn't a weight issue because

in order to get the shuttle orbit like [REDACTED] you had to have a light payload. The issue was

how can you get this thing into the shroud of an ELV with these [REDACTED] and you didn't

want to have too much articulation and so on for fear of mechanical failure which we had on

Galileo. So, those were really the major technical issues we dealt with, these new deployment

problems. [REDACTED]

[REDACTED]

H: What were your relations with NSA, where they good? M: Very good. I mean INMAN and I really connected. In fact later, much later, I was the one who helped persuade Bob to go to Austin and set up MCC. That was funny. Bill Norris who headed the CDC at the time Control Data Corporation, wanted to set up this consortium called MCC Microelectronics and Computer Corporation, and he came to see me. I was deputy administrator of NASA, when he came to see me. He said what do you think of this idea of a consortium. What they were interested in was to make the fifth generation computer to beat the Japanese at doing it. Of course the interesting thing was, that the Japanese weren't anywhere close to making it happen, which we found out later. He said, we are looking at Stan Turner for this job, to head MCC, and you work for him, and what do you think? I said, well, I like Stan, but he is not a technical person. I said, if you want an Admiral I've got one for you, why don't you try Bob INMAN? Norris then said, but INMAN isn't technical either. I said yeah, but he has been kicked around the intelligence world and the technical world, so he is very, very, familiar with it. Actually INMAN was a graduate of UT Austin, who majored in English Literature. H: Very impressive. He's got almost a

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photographic memory. M: He is a very impressive guy. So, I see him after a few weeks. We wound up at some party together in Austin. Let's see I've brought some notes here to see if there is anything else I need to talk about. [REDACTED] **END**

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[REDACTED] That was done during the period I headed the NRO, and that was relatively inexpensive, so it didn't really show up very obviously, but it was an addition, and it was included in that [REDACTED] in the '81 budget that was put in. I was second to the effort. Bob HERRMAN of course was Director. Bob is a friend of mine also from earlier times, he had been in the NSA, and I knew about him there. I had asked him to be Assistant Secretary for R&D, before I became Secretary of the Air Force. That job fell vacant when Jack Martin left. Bob was in OSD, he was working for Perry at the time. I thought that would be a good pipeline for the Air Force to have. So I asked him to come over before the NRO issue came up. Then, when John STETSON left the Secretary's job, Harold asked me to be Secretary. I said, Gee, I'd like to hang on to the NRO job, and he said no you can't do that because the Secretary is a public figure, and this is their black program and so I said all right. When we looked for an NRO director, and Mike STAREHOLD said why don't you pick Bob, because Bob is assistant Secretary for R&D, so I handed the job over to him I think it was October or November of '70, so for the first few months I was Secretary, I had both, then Brown became director. Then, I moved over to NASA in spring of 1981, when Reagan came in, and Pete became the NRO Director. I remember we used to have breakfast meetings in my office in the Pentagon; they were called the Corn Flakes Club. We used to meet at 7:00 in the morning with the SAFFS staff, and other people were invited when necessary. When I became Deputy Administrator of NASA and Pete became NRO Director, I

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said why don't we continue to do the Corn Flakes Club? Pete called me back about a week later, and said, I don't want to get up that early, but I tell you what, let's start the Corn Beef Club. So we continued that with lunches. My relationship with Pete during the three and a half plus years I was Deputy of NASA were okay, but he was not able to really control the Air Force Program properly I thought. So, the whole business of using the shuttle was reversed, basically when Pete was Director. H: Now you had been on both sides of this equation, working with the Air Force on the one hand, and then. We were talking early before we started about the different views they had when you went to NASA. They were not very happy about trying to incorporate any military. M: NASA was not happy about the military either, it was on both sides. The country lost something when we failed to impose a marriage between NASA and the NRO. One thing that happened is that NASA could not sustain the original programs. The original shuttle program had five birds, but the real important point was, the hot production line. In 1980, that was reduced to four, and I remember bitterly arguing that if we can't have a fifth bird, then we must have a spares program. We must build some spares in case we lose one. Because we had a mission model which was at that time quite robust. Twenty plus missions a year. We won that one. Of course if we didn't have those spares when Challenger was lost in '86, we would have been in real trouble, because we probably couldn't have built a replacement. Atlantis was the replacement that we finally built for the Challenger. H: What was your reaction when we lost Challenger? M: Alright let me tell you the whole story. I moved over to NASA in March of '81. I was nominated early in March. I got myself a desk over there, although I was not confirmed, I was there already. The first shuttle launch was in April, and because Bob FROSH had resigned before January 20th, before the change. Al Lovelace was given the title of General Manager of NASA. Both Biggs and I were waiting for our confirmations. Since the deputy is kind of the

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internal manager, I made it a point to really make sure the shuttle went up properly. I put that on my own highest level of priorities, so I established the practice that I would be at the mission control center in Houston at every launch. Not only that, I would be on the web, on the net, I would have a desk where I would sit and so on. So I was there for the first launch, even though Lovelace was at Kennedy for the launch. I was in Houston, and established the precedent that I would basically sit there and give the word. On the second flight, which I think was in September of 1981, if I remember correctly, that was the first time we saw a problem with the O-ring. There was a major erosion of the seal. I remember worrying about that at the time. We said look, we don't have any experience really, let's just fly it again and see what happens. So for the next ten flights, we saw nothing everything worked. Then, on flight number thirteen, it was either twelve or thirteen, we saw it again. At that point, I said hey guys, we've got a problem, and I issued an action item a memorandum at the flight readiness review for the thirteenth flight, I said, okay we'll go ahead with this, but. This was after we had seen it on the twelfth flight I think. H: So, you have seen it twice now? M: We've seen it twice. The second time we saw it, we did a flight readiness review for the next flight, which I think was in April. I can't remember if it was twelve or thirteen, but it doesn't matter to me, it was the flight after we saw the erosion for the second time. I issued a memorandum, which said that I want a complete review of all seals and joints on the solid rocket motor, in order to get to the bottom of what was going on. I wrote that memo to Malloy who was the Project Manager for the solid rocket at Marshall. He was the action person for it. ABRAHMS had signed on it. I was the initiator, and (ABRAHMS) was the executor; Jim was the head of space flight at the time, associate administrator of space flight. Although he was leaving to head the SDIO, Strategic Defense, at the time, he was just leaving NASA. About two weeks after I issued that memo I made the decision to leave NASA, I had

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gotten the offer from Texas. So I was a lame duck. That review not held for 15 months, while they continued to fly, while they continued to see more erosion. At the same time BIGGS got into a fight over my replacement with the White House. I was not replaced until December of '85. I left in September 1984. My resignation was May 30th I think, then I stayed on to clean my affairs in Washington a couple of months, but I was already spending a lot of time in Texas. I can't remember exactly what the date was. I gave them a deadline date of my review sometime in the summer, but it was essentially after I was no longer involved. I was not replaced, so the paperwork I had on all that was not given to anybody. It just sat there. My friends tell me that when the issue of BLOW BY came up on subsequent flights because subsequent to that flight we had it on nearly every one. STENMAN was always saying well that is being looked at because Malloy knew about it. Malloy had received my memo, but they weren't ready to go and fess up that there was a real problem to their management. So, nobody insisted on having that review. BANKS didn't insist on it. Didn't know about it perhaps even. Mike WEEKS finally held a review, and I remember it was 15 months after I wrote the memo so it must have been, I wrote the memo in March of '81, so it was June or July of '82. WEEKS was the guy who took the briefing, so BANKS wasn't even in the briefing. What happened then was that in December, Bill Graham, who was the guy that BANKS was resisting, in December of '82 he finally became Deputy Administrator. I called for the review in May of '84, and it was held in July of '85, because the accident was in '86. BANKS wasn't at the review. Mike WEEKS who was a Deputy Associate Administrator took that review. So, it had been depressed from the senior management, by one level. In December Bill Graham became Deputy Administrator. So BIGGS had fought with the White House from May of '84 when I submitted my resignation, to December '85. So for a year and a half, my job was vacant. Two weeks after Graham comes in,

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BIGGS is indicted for fraud against the government for things he did while he was at General Dynamics, and is removed from his chair. Put on leave with pay until his legal issues were resolved. Bill Graham, becomes acting administrator with no experience in management, no experience in space flight. The guy was an analyst, a weapons analyst, he was a good guy, but he had absolutely no experience. I panicked when I heard that. I wrote a letter to Vice President Bush, and if you like I'll send you a copy of it, in which I said the situation at NASA is very troublesome, because you have a no experienced person leading the agency. God help us if we have an accident under that situation. That letter was written 6 weeks before the Challenger blew up. Then I said, get somebody like Jim Fletcher who know this business, put him in as acting administrator for 6 months, Bill is a good guy, he can learn, but do not have Bill Graham sitting in that chair for any length of time before he has some experience. H: Did you get a reply from Bush? H: Yes, I got a reply, I'll send you that too. I got a reply from Bush saying, well, it's an interesting suggestion, and I like Jim Fletcher, and I like Jim BIGGS, and I'll look into it. That was the end of it. Then, I wrote him another letter after the accident; I said for God's sakes, get somebody in here that can make this thing work. H: You worked in both administrations. Did you see differences? Between the Carter administration, and Reagan? M: You know the major consequence of working in both administrations is that no one trusts me anymore now. There were lots of differences. Jimmy Carter was a micromanager. I think in the end he was uncomfortable in the presidency. You could tell when you went to meetings with him. I remember we briefed him on one of our systems once, and he started asking me technical questions. It was funny because he wanted to know what a sun synchronous orbit was, and I explained it to him. Harold Brown was sitting next to me, and Carter kept asking questions like this and finally, Harold couldn't contain himself anymore, and he says Mr. President, he said,

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what we need from you are decisions as to what to do about these things, and I've got a hundred guys in the Pentagon who can tell me about orbits. I think that's what led to his losing the election. I got the distinct impression in sitting through meetings with him, that he was uncomfortable in the job. Reagan on the other hand was not. Of course he was also not nearly as much on top of the details of government the way Carter was. Reagan had the ability to prioritize. He had the ability to say, there are two or three things that I think are important and we're going to do those. Then to structure the bait on them. Jimmy Carter didn't do that. I sat through meetings with Mr. Reagan also on the space station issue, because the big thing we did in the first four years was to get the space station program pushed through the Congress. I stayed long enough to do that. That was my priority there. Reagan was clearly interested in this business. Carter was not really interested in NASA, he was interested in intelligence satellites, all presidents, because that is their morning pictures. The only time I ever got a phone call from the White House was when something wasn't working, and they wanted to know where the hell is the data today. Haines: That is the images? Hans: Images, well [REDACTED] [REDACTED] that was good too. Reagan was very different. Reagan had clear priorities, and he also dominated the people working for him. Reagan was a very, very, effective leader. You know, to have people like WEINBERGER and Shultz, who are absolutely first class guys to defer to Reagan was, and I saw both of them behave that way. In ways that Harold, and Vance and people in the Carter administration never behaved toward president Carter. It was interesting. Reagan had this aura about him. The press you know just flat out never understood that. I had the advantage of seeing Reagan in California I was the Director of AIMS. His term as governor, and my term as Director of AIMS, overlapped almost one to one. He got very interested in what we were doing; because we had gotten two U2s from

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the Air Force early in 1970 I guess it was, when they were phasing out the C models. When the R models came in, I went to George LOVELL. I thought it would be interesting to have earth observations. Airplanes were beginning to build unclassified earth observation satellites, landside, and I thought it would be interesting to have airplanes to do ground truth and to do things in preparation for the satellites. So, I went to my friends in the Air Force, and I said how would you like to lease two airplanes to NASA. Then, I went to George LOVELL who was Deputy Administrator at the time, and I said I'd like to get these U2s, and he said, my God, remember the Gary Powers incident, NASA was the cover for that flight. When the press went to GLENNON who was Administrator at the time and said what about this airplane, GLENNON said what airplane? He didn't know anything about it. George finally said, okay you can have them, but paint them white, so we had 2 white U2s. Reagan got very interested in that, because the first thing we did was to do forest fire control. We flew the airplanes over every forest fire. We had the cameras arranged so that the photographs would come out at the same scale as the topographic maps that the firefighters were using. The big thing of course you can do with IR sensitive film, is to tell when the fire is out. One of the real problems with forest fire fighting, is that you never know when a fire is going to flare again. We could tell when the fire was out because we could see the hotspots with the IR sensitive film. Moreover, we had a system developed finally that we could get the photographs to the fire lines. We would drop them from little airplanes two hours after we took them. They were really tactically useful, and Reagan was really intrigued with that. When we had the first few successes of that, he called me up, and said I want to visit with you, and so I went to visit him in the Governor's office. Jelly beans on the table, everything that he had later on when he was President. He was a very, very impressive guy. Poor guy is ill. It's interesting that the American political establishment never understood

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that, never understood his popularity. Haines: I'd like to get into something for the next few minutes. You said something about Pete not being able to control the **END OF SIDE TWO TAPE ONE** H: One thing I'd like to talk about is the Navy, Program C, what was happening there? Did it just roll along by itself? M: The Navy had the enormous advantage, of having a great expansion where there was enormous competition for who gets the new programs. I told you already about the competition between Program A and Program B. H: Which is always somewhat healthy. M: Of course it would be. We got a better system out of it, because we had the competition. Competition only becomes unhealthy I think when people fight over scraps. Where it doesn't matter much what you do. Here people were fighting over something real, and it mattered very much in the end how we did it, I think. I was very, very, lucky when I was Director, because, LOU ALLEN was head of the Air Force Systems Command, was then Vice Chief of Staff, and then later Chief of Staff, which I engineered for him to become Chief of Staff. And LOU had come out of the NRO. He was SAFFS, so he knew what we were doing. He was a technical man. He has a PhD in Physics. Harold Brown is an old friend; I've known him for 25 years when I was in the NRO. I could get to Harold without any problem at all. H: You had direct access? M: Absolutely. H: Did you have the same access with Turner? M: Sure, I worked directly for him. I had support that my successor did not have. If you look at my immediate successor, Bob HERRMANN, I think didn't have problems really, because I was still there. So, whenever he had a problem, I could do things. Bob really to give him credit, he was really the one. He is very bright. He said, okay look, you've done the technical stuff, you have initiated a lot of new programs, my priority is going to be to tie these things into the military. It was Bob HERRMANN who started TENCAP. I mean we had TENCAP when I was there, but I never paid any attention to it. It was Bob who started to make that work properly, and who worked out

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the systems, the ground systems, for how you deal with the data and how you declassify it, and all the rest of that stuff. So, Bob HERRMANN'S priority was that, and of course I supported him with that. He and I were in that era when we really expanded the program enormously. Again, everything was driven by the president's interest in the SALT business, and then we did our own thing within that, but that was the political driver. When President Reagan came in the priority on arms control of course went way down. SALT II failed because of the invasion of Afghanistan. Pete Ulrich did not have that fortunate situation that I had. WEINBERGER was Secretary, (BERNORR) was Secretary of the Air Force. H: WEINBERGER is not a technical person. M: Neither one, neither VERN nor WEINBERGER were technical people, and furthermore they were people who Pete didn't know. They were both friends of Reagan from California. And, Pete was basically a Washington operator. He's a Texas Aggie. Pete didn't have the same advantage, so he could not do what I did in terms of dealing with Program A and Program B, and Program C, because he didn't have the connections I had in the Pentagon. So, to some extent, when I was over at NASA and worked with Pete, I saw the arrangements that I had made, say to use the shuttle for example, fall apart, because the bureaucratic imperatives began to dominate again. H: Or, was it the military imperatives, the shift from a national priority, or requirement, SALT II verification. They use the terminology today, the support to the warfighters. M: That I think was also part of it. The decline in importance of arms control in the Reagan administration was certainly part of it, yes. But anyway, it put Pete at a disadvantage to try to keep this together. Of course in the end, he said look, I can't win this one, and then didn't try to keep it together. We had to keep it together because we have nailed down during my term, and Bob's term, the launches of two critically important systems, namely [REDACTED]

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launches for these systems. There was nothing that my successors could do about it, except to carry it through. There were a few officers in the Air Force, who really did want to use the space shuttle, but they were in the minority, and they were basically not promoted in the end. The division now is complete, it's too bad. I can't even say that because if you don't have a robust shuttle program, which we really don't have now, then it's risky. If we had been able to make the marriage stick, then both the military and NASA would be ahead. H: Is that your major disappointment? M: The major disappointment is, that if we had succeeded in the marriage with the military, then we would today have a production line where we could build new shuttles if we had to, because it would be a military requirement to do that. Instead we went back to older technology, to expendable launch vehicles, and we now have two systems, and the cost differences aren't that big. It wasn't an issue of cost; it was an issue of control. I wanted to privatize the shuttle even back then, I wanted to say look, if you set up a corporation like COMSAT to run the shuttle, and have a board of directors, where the military is represented, in fact put in the law that creates this government supported company with private investors, like COMSAT. We set up COMSAT in '62. In the beginning, the government had the majority of the stock. In '69 it went private, seven years later. What I had in my first shuttle was the same thing. You set up a corporation, and of course the private shareholders were represented on the COMSAT board, as well as was the government. I had the same model in mind, and I would have even put in the law that a serving military officer should be the CEO. Just the way in the case of the NSA; It's a three star slot. I would have done that with the shuttle thing. We would have a production line today, and we would have more capability, because up until we did the TITAN IV, we really didn't have an extendible launch vehicle that had the same payload capability that the shuttle has. H: The other argument would be though that the military would

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have a tendency to take it over, and that military priorities and requirements would then transcend national requirements. M: I guess, it is up to the political leadership of the nation, not to have that happen. I don't think that was a good argument. I never accepted it. H: We were talking as they were changing tapes about how you dealt with the program managers. Now do you want to talk about your relationships with Jack KULPA and Les DIRKS? M: You know, as I told you in the beginning, the one thing I realized after two weeks in Washington in 1977, is that both DIRKS and KULPA were first class people, and I wanted to keep them on, and so there were no changes made during my two years. Both Jack and Les, were first class technical people. They respected people who understood the details of the technology. The way I worked with them was very simple. I sat down with them and we'd have long, long, meetings going through every technical detail of the program we were discussing. You can ask Jack, I made the practice, that whenever I had a program review, every last First Lieutenant would get a follow up letter from me. They're probably in the file downstairs. That created an atmosphere of which even though there were disputes, I could adjudicate. We would have meetings with three Program Directors where only four of us in the room, and no one else, and hash out problems. That was part of it, but I think it was also critical that each of them knew that I could get to Harold Brown directly, that I could get to LOU ALLEN directly. Rewards were important. I got Les DIRKS elected to the National Academy of Engineering, and that was difficult because very, very, few people have been elected to the academy for classified work, and I remember we had to get a committee, in fact I think Al FLAX headed it. Of course, Al got in the same way. H: Oh, is that right? M: Sure, he got in because he was Director of NRO. And Al, and Plummer, well Plummer got in later. I think Al was the chairman of the committee. I nominated Les and got the letters written and he was elected. If you can do things like that, people will say, well it's okay to listen

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to this guy. In the case of KULPA what I was able to do, was to persuade Lou ALLEN to put stars on the first group of Colonials who had no flying background, who were space officers only. Prior to that the people who been in the NRO, the Air Force people who had been in the NRO, transferred in. Bob King, Dick Henry, and all those guys had wings, so did Lou. Lou was a bomber pilot. I vividly remember that Don KROMER and Nate LINDSEY were the first two Colonials who were not rated officers whom we put up for promotion to Brigadier General, and Don I think made it the first year, and Nate made it the second. Don wound up with three stars and Nate wound up with two. Of course the classic example was Tom WERMAN who was my Deputy of military assistants when I was Secretary of the Air Force, he was a Lieutenant Colonel at the time, and now he is Four Stars, Vice Chief of Staff of the Air Force. That wall was broken at the same time we broke the budget wall, and before that, there had been a very real barrier to anybody without wings getting a star, few got it, but not many. We also did that in the regular Air Force because I remember I went to Lou Allen once and when I was Secretary and I said, we need to have a four star who is not rated. You can't have an Air Force where only twenty-five percent of the officers can look forward to getting a star. You have got to open that up. So Tom Marsh, who was the first non-rated four star, since OZO MCKEE. OZO MCKEE came out of World War II, and he was an air crew member, but he was not a pilot, and he was the only air crew member ever to make four stars. He was also Vice Chief of Staff. So we broke a lot of barriers at the time. Tom was made head of systems command, as with his four stars, Marsh. Of course, since then, as you know, lots of people have made it to four stars. Tom Moorman is the first one to get to be Vice Chief. That was also something we did when I was in the Pentagon. The argument was, that the Air Force, in addition to flying airplanes, also has to do with the engineering, and the science. And, do you want to shut off, the majority of your officers, from

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becoming generals. If you put it that way the answer is no, you have to do it. H: One area we haven't talked about is, we looked at that memo earlier, on your suggestion that they declassify NRO, you want to talk a little bit about that? M: That was funny. There are really two issues here, it's ironic that today, I saw on television in the morning, the confirmation hearing of Anthony Lake to be the Director of Central Intelligence, and somebody asked him about secrecy. He said basically what I said, now god help us twenty years ago, that we keep too many secrets. The more secrets you keep, the harder it is to keep secrets. You want to be very careful about what you keep secret. What I wanted to declassify, what I put in my final report Harold Brown, and to Stan Turner, was the existence of the NRO. Now you remember we classify the existence of the NRO, back in 1960, for two reasons. One was, that the Russians or Soviets had given us to understand, of course they were annoyed that we were over flying them with U2s, but they also knew that you over fly with satellites. Basically, they had given us to understand through back channels, that they couldn't do very much about us over flying their country with satellites, but they didn't want their people to know about it. So, there was kind of a gentleman's agreement. I think Alex Johnson was the one who negotiated that. He was an assistant Secretary of State at the time. There was nothing on paper, but it was kind of an understanding. The other reason of course was we didn't want the Soviets to know how well we could do. My argument was that I understand the first reason you have to keep the whole program classified, the existence of the office and everything else, you know the sensitivity of the Russians. However, the second reason, was really not a good one because you can keep the systems classified, you don't have to keep the existence of the operation classified. So, if you classify the satellites properly then, okay why did I put that into the letter I wrote? H: This is a proposal of openness long before it really became popular. M: Right. I put it in the letter because the arguments that we were making

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publicly to enhance our military capabilities in view of certain threats that Soviets presented, were becoming less, and less credible with the American people. The only way to establish credibility would be to say, we know all this because we have a reconnaissance system that can tell us, we can't tell you the details obviously, but believe us, we have this office, we know how it works. I was motivated by that, that we were hurting ourselves more, by keeping it secret, rather than letting it go. There had of course been plenty of leaks by then, by 1980. That is why I told the story in the memo about the little boy who said the emperor has no clothes. It is kind of foolish to keep something secret that everybody knows about. I thought we should do it then. Of course, it really stirred up the establishment. I remember, that people didn't like to hear that. So, we kept it secret. It probably hurt us to do that. I also have to say that I am a protégé of Edward Teller, who has argued very consistently for many years, that we keep too many secrets. That hurts us because it hurts our ability to do technology since we don't exchange information as freely as we should. But possibly more important, it's good for the rest of the world to know sometimes. We really can do good things, and we really are strong. Edward had that view, and I guess I shared it. H: Let's take a couple of minutes, and look at where we are today with the focus on support for the military, and support for the warfighter. How do you see that? Do you see that as natural evolution, of the NRO, and where the NRO should be today? Should there be an NRO today? M: Well, the world works in strange ways. I was here in town last week, visiting with General Lyles down in the Pentagon, talking about ballistic missile defense, and exactly the same question came up, should there be a ballistic missile defense office today, or shouldn't we give it to the services? My instinct there in fact is to do that, to give it to the military services. That is going to happen. Last December in fact the procurement authority was taken away from the BMDO, and has now reverted to the services. Should there be an NRO? H: Given the fact

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that it was a cold war creation, when the cold war is gone. M: It was a cold war creation; I mean the original motivation was to monitor the Soviet nuclear weapons program. I would probably argue that there ought to be a phase out, and that it out to go, I don't know. The problem is this, that there are non-military reasons for doing satellite reconnaissance classified satellite reconnaissance. I can't judge sitting here on port what those are. The case of doing away with the NRO is not as clear as the case of doing away with the BMDO. I mean I can sit here and say I don't think we really need a BMDO, the military services can do that. It's not that clear. I think one would have to set up a review group to look at that, which is of course what Jerry DANNEEDEN and Dan Murphy said we should when I made the suggestion to declassify the NRO. It's not as clear, and the one thing that is going to happen I think, is that space reconnaissance will become less important. H: As it becomes commercialized? M: Yes, commercialized and other things. What is going to be important are highly capable UAV's, with the small computers, and the small sensors, and the miniaturization of everything. We cannot put things on small airplanes that we couldn't do before. The necessity to go to space is not there anymore. The flexibility we need now, that we didn't need when the evil empire was around, because we knew where to look. That flexibility of course, is better with airplanes, than with satellites, because Newtonian orbits do restrict what you can do with a satellite. I'd have to look at that one very carefully. I can't answer that question. What do my predecessors, and successors think about that? H: Well, they are pretty split. Some think that it is absolutely essential like MOSEY was saying that we may have slain the dragon, but the snakes are still out there, so you still need the capabilities. M: I would say that if you are slaying snakes than what you want is airplanes, because the snakes can't shoot you down the way the dragon could. I would want UAV's with healthy properties and very highly capable communications and data links, and you

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can do that now. H: I think that might be a good spot to end it. I really thank you for your time. We made it. Wonderful. M: Let me ask you a couple of questions. I wrote a book about my experiences in Washington, in which of course I did not mention the NRO, but it has a lot of things in it that you might be interested in, specifically about the shuttle. Let me send you a copy. H: Please do. M: I will also send you the letters I wrote on that too.

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