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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] 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] 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

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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**

**OF SIDE ONE TAPE ONE** [REDACTED]

[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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