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INTERVIEW WITH DR. MAXIME FAGET
INTERVIEWED BY ANDREW J. DUNAR AND STEPHEN P. WARING
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1. DUNAR: Our task is to do the Marshall Space Flight Center from 1960 to 1990. Of course it is hard to jump right in in 1960, so our first chapter goes back and has the background from Peenemuende to the establishment of the center. So we have one introductory chapter that takes it up to the establishment of the center in 1960, but we are looking at that earlier period, too, because of course that is when....

2. FAGET: It got started in 1960 not 1961?

3. DUNAR: Yes, it actually was in 1960.

4. FAGET: I remember Abe Silverstein dealing with that and finally announcing that that would take place. We southern guys at Langely ....he said, I am going to Huntsville. I said, well what are you going to do down there? He said well I am going to inventory what they have got. I guess the deal was to make sure we could get all that we could out of the Army.

5. WARING: It might take a while to do inventory on a place like that !

6. FAGET: You bet! We had shops that had been NACA's. We had stock materials, bar stock sheets, machines... They had already made one trip there and they said, you think we have a lot of stuff, you ought to see those guys! They have been scurrying things away ever since they got there! It was amazing what they had! I thought that was kind of funny! It was an aggressive outfit, no doubt about it. Von Braun was a very aggressive guy. He had the balance of the future right from the start.

7. DUNAR: What was your feeling from coming from a very different perspective, not being from the Army background, from the NACA side. What was your perspective on that process by which ABMA came into NASA?

8. FAGET: Well, it was quite clear right from the start that those guys wanted to be part of NASA. On the other hand, they were building rockets for the Army. The THOR, Jupiter and that stuff. I can understand what the problem is. But it certainly didn't surprise me. It

happened a little bit more rapidly than I thought. Of course a lot of things went on that I wasn't aware of.

9. DUNAR: Did they make a mistake in delaying do you think in coming into NASA?

10. FAGET: I don't think it could have gotten in any sooner. At that time, ballistic missiles were a big, big program. A crash program, if you will, given the missile capacity. The heat was on of course as soon as the Russians put up Sputnik. Everybody said, well you know you have got to get into space and show them that we can fly in space like they do. Another application was that they had to have the carriers for their warheads. They weren't going to any peon ballistic missile development. The army was in a struggle with the Air Force at that time. A very, very almost like warfare between those two guys to win the strategic missile. That was a game. Who was going to end up controling all the strategic missiles. On the offset wing, we said well, you can handle the tactical missiles and the Air Force can take the strategic missiles.

11. WARING: When the Army crowd did come into NASA, did the members of the Space Task Group regard von Braun and his team as being potential rivals?

12. FAGET: You bet. He was a big, big [059].... compared to what we were. We were just poor country boys in comparison to his background. He was much better organized, he knew about space project. He had been working closely with JPL on all those flights, he was there. And, this is between you and me, those guys knew a lot more about how to develop ballistic missile than the Air Force did. That was clear to me. Those Air Force guys were just in this thing for the money. They were very shrewd. They would get all the money, those guys would build them. When it came to nosecones, at least I thought that was very entertaining. The Air Force was trying to develop a [073] nosecone that was huge to [074] and had to be polished. [076]....I have always been a very practical guy as far as practical is left field, I am as far out in left field as you can find anybody in the space

program. I should have appreciated that. But, they were on the right track.

13. DUNAR: One of the things that developed through the course of the relationship between Marshall and the other centers was a sense of center rivalry. I wonder if maybe you could describe a little bit about of where that came from, the orgins of that?

14. FAGET: The Space Task Group was not a center, it was started off as a part of the Langley Research Center to execute manned space flight. So we were a bunch of upstarts in their eyes, in some ways they tended to treat us that way. We could sense that. On the other hand, as things developed we were positioned to win a lot of programs that they just wanted to do. They were always trying to get into our business right from the very start based on what we thought. I guess we were just too fast on our toes for them, we could get [100]. My very earliest experience in the space program was shortly after Sputnik flew. There was a big hue and cry from within Congress and the Whitehouse and the press. The press always tends to go back...I guess that's an application factor divide by a decimal and anything can happen. They aroused the public .. Anyway, something had to be done. Lyndon Johnson was preparing legislation. The guy, he was a scientist, Killian, he was the President's science advisor. He informed the president (he was a friend of NASA) to enact NACA before all this thing came up. NACA was a very modest organization and had a very high professional reputation. Virtually hidden, almost a recluse from the standpoint of publicity. They tried to avoid it. Many of the NACA programs, I guess about 90% were directly due in the classified area and closely enough related to NACA. They avoided publicity. They got all of their support from the Air Force and the Navy primarily. Some from the Army too, helicopters and things like that. So they regarded the Air Force, Navy, and Army and the U.S. transporation industry as their customers. Our biggest customer being the DOD under Bernard Jones [138]. So they would let the DOD people [139]. When the corporations finally came around, they would try a [140] where they would talk to

their appropriation people. That's how they got their appropriations using that testimony [144]. So, our business was not to go with a big public display in order to support our appropriations. There was no other reason to seek publicity. There were a lot of reasons to not to seek publicity. We would get in trouble with our customers because they were classified in what they could discuss. It was almost like recluse from the standpoint of pychotic attitude towards any publicity.

15. WARING: Was there a resentment then at von Braun's flamboyant nature?

16. FAGET: Well it certainly, certainly showed you know. We talked about it. There was a resentment and a continuing resentment after he got into the NACA about the press saying we got all our rocket skills, thank God we captured all those guys from Germany. They were good guys, but they weren't more than several dozen people and it really turned out real good. There were thousands of people kept building them better. But, in the notorious book that the guy who wrote Hawaii, Michener said that Germans scientists ran NASA [167]. That said something about Michener. But they had good friends in the space program. But it is perceptions, you are right. It's a feeling, I don't know how to express it around the centers.

17. DUNAR: Probably the perception from Huntsville would be that the Space Task Group had advantages in terms of having been in on the ground floor when NASA started. As things went on during the 1960's, how did that political play between Huntsville and Houston work and what were the advantages that each side had in that tussle?

18. FAGET: Well, one of Huntsville's biggest advantages I always thought was George Mueller. At least to us, talking about myself in upper management, we always felt like Mueller was trying to take some of our stuff away. As a matter of fact, he did.

19. WARING: Through Skylab primarily?

20. FAGET: Skylab. He tried to get the major part of the shuttle program, too. We found it hard to maintain, of course we did end up with the orbiter. We started off with the orbiter and they started with the booster. The booster turned out to be two solid rockets and a tank. We got everything else. Of course he put the engines in the orbiter, but still it was our orbiter. I can see how that might have rankled them, but that is the way things turned out. Thank God, we did get the orbiter. I think that we did a better job on the orbiter than they did on the boosters. As far as the main engines, I also felt like we could have done a better job on that too. I am being very frank with you.

21. WARING: Do you think the engineering skills at Marshall deteriorated over time?

22. FAGET: I think they improved. I am talking about up until about 1960's.

23. WARING: Do you think in the 1970's Marshall was a better engineering center than it was during the Saturn years?

24. FAGET: I am trying to think, one of the troubles of old age, what are the 60's and what are the '70's! Yes, at least as good, if not better.

25. WARING: Why do you say that?

26. FAGET: It became a little less...during the Saturn years...I guess one thing I got to know the people better. That might be a prejudice. There's no doubt about it, they did a good job on the Saturn, it was very, very successful. I might want to modify my opinion on

what I think about it. The difficulty in the Saturn years was almost like a military army base. Everyone was highly disciplined. [There was] a tendency that the lower level people make no decisions at all. It has to be worked all the way up to the top and then come down. The NACA cultured the Space Task Group going into this center. The bottom, strictly bottom...everybody was always free to say anything they wanted to. If you thought the center director was not doing his duty, he would tell his boss and he in turn would tell the center director. I would say well, hell, let's got talk to the center director about it. It was very democratic as opposed to wanting you to work facsist. A military-like discipline towards authority.

27. WARING: Were there differences between the centers, do you think, in their approaches to engineering? That is when Marshall went about designing something, did they take a very different approach?

28. FAGET: Marshall had more depth. There just is no doubt about it. Where they had a very, an outstanding advantage over us, they had manufacturing capability, they had an approach that the Air Force didn't have that the Navy at one time had. That has been lost to the country and it is a terrible loss. An approach when you worked as a team, termed the "Arsenal Approach," where the people who worked together were actually capable of doing a complete job. If you are not capable of doing a complete job you don't have anyone in the organization who understands the job, unless you import them from outside. If you import them from outside you take all the baggage that come with it. The baggage is quite often a complete misunderstanding of the role of what the government is suppose to be doing. A person that starts off in the government, matriculates through the various levels ends up feeling, "You know I am a public servant, I really am a public servant. I make my decisions with great loyalty to my government. What I am looking at is the best interests of my people that pay taxes."

29. WARING: Were people in the Space Task Group in the Manned Space Center jealous of the arsenal system? If they had had the opportunity would they have preferred to do that?

30. FAGET: We did have manufacturing capabilities. What we tried to do when we came here was try to create that same kind of in-house capability. Our in-house capability was limited to making fairly small things. What you might call in engineering, laboratory kind of model shop type approach. Working models, one of a kind, as opposed to a production line. So although we had manufacturing skills, it wasn't the kind of manufacturing skills that they go into complete systems.

31. DUNAR: Why was that lost to NASA? Clearly Huntsville wanted it and you wanted it here? Why did NASA lose that capability?

32. FAGET: We have something in this country called the military- industrial complex. Industry doesn't want the government handling it. The way things work, you have to understand, very simply, the Congress votes appropriations to DOD and NASA. NASA gives the contracts to industry. Industry supports the backs of the Congressmen. We all get our backs scratched, but through this shroud and what Congress wants is to make damn sure industry gets fed. That's what Congress wants. So they see the government's role as contracts to industry. NASA always stands still for it.

33. WARING: Do you think that's been one of NASA's biggest problems over the years?

34. FAGET: Yes. It certainly is because NASA....well, look at the way we did things at the Johnson Space Center when we first got here and the way you do things now. When we

first got here, we at the Johnson Space Center knew a hell of a whole more about spacecraft than industry did because we essentially built a lot of the Mercury program in-house. There wasn't anybody else building spacecraft except McDonnell-Douglas. We had a much better control of that process. We had a role. But then as industry gets to do all the job, the people here at the center get do a decreasing part of the job. During Mercury, during Apollo, contractors worked directly on the project. We did a lot of back-up work and a lot of separate independent testing. We also developed back-up systems. The kind of fuel shuttle like the Gemini was going for, we didn't know what kind of fuel shuttle. Things like that. Those came in quite valuable. The first test article that flew in the Mercury program was flow some 8 months full-scale after we signed the contract with McDonell-Douglas. We flew a full-scale Mercury test target with the same mole-line, with the graded heat shield and proved the re-entry concept.

35. WARING: And that would not have been possible without that in-house ability.

36. FAGET: That is not possible now in any way. There is no way anyone can do that. We could prove a piece of hardware faster than these guys over here can get a [344] study done. Almost faster than they can get a contract for it. But by the time they go through the procedure writing RP and having all the "rain dances" prior to and after award and all that.

37. WARING: Why is there so much bureacracy now? Is it because there are more contractors?

38. FAGET: It goes around in a circle. That is the way everybody likes to see it. That's the way no one likes to see it, but that is the way the circle goes.

39. WARING: But I mean bureauracy in terms of red tape and layers of approval. That

wasn't there in the beginning was it?

40. FAGET: It's contract award regulations. This is what is call the third right position. All spelled out the procedures.

41. DUNAR: And that has gotten more complicated?

42. FAGET: Embellished. It continues to get more so as time goes by. That has made it hard for all this industry. So it is very difficult to do that.

43. DUNAR: To shift gears a little bit, in the late '60's at the time when Marshall was finding that it was having RIF's and the Saturn Program was at an end, that was a crisis time for Marshall. We are interested in that period and I was wondering if you could give your perspective on the issues, one of the main issues being the whole question of Skylab about the future of Marshall and how that is seen from Houston.

44. FAGET: I guess in the late '60's, I will give you my impression. I think a lot of people here worried about it. The Apollo Program was a tremendous surge of effort and you wind up a spring real tight and then you let it go kind of thing. Emotionally, it was like a tight wire. It was a tremendous let-down all over after that program was over. I guess at that time people began to take stock. Where are we going from here? At that time it became obvious I think that we had one too many centers and we have had one too many centers ever since then. In NASA in trying to divide up the work and satisfy Congressmen from Texas and satisfy the congressmen from Alabama and so forth and so on, and have dealt with that. That has added to the burden and helped to make things less and less efficient in NASA.

45. WARING: Was that a wide-spread feeling that there were one too many centers do you think?

46. FAGET: I don't know. We talked about it from time to time and I think that nobody really liked to promote the idea, because who was going to get the axe? We felt like we had all the votes in our pocket. We felt that sure it was a good time to get rid of Marshall and Marshall folks thought it was a good time to get rid of us!

47. DUNAR: There was discussion at the time of the idea of closing Marshall. Do you remember any of that discussion at all?

48. FAGET: Yes. Only vaguely. I know there was talk about it here and that was unofficial discussion. I don't think anyone really thought seriously about it and I assure you that nobody around here tried to promote that idea. But it did seem like to transfer some people to Houston and maybe some people moved to Marshall. The thing that Houston had this Marshall [420] and probably end up like old Langley, [421] except we had all the operations down here. The astronauts were down here and it would be very difficult to get rid of all that.

49. WARING: We have learned more about that in the last few weeks that was a very important advantage that Johnson has.

50. DUNAR: Marshall in a way reached into Houston's territory with Skylab. Did Houston fight that? Or should I say, how did Houston fight that?

51. FAGET: We did fight it. I wouldn't say very successfully. The Skylab was a very interesting program. It started off, it was something called Apollo Applications Program,

something like that came before the Skylab. I think that was one of George Mueller's pet ideas. I always thought it was pretty trashy to tell you the truth. It really wasn't a very sensible program. We and Marshall both, were thinking in terms of a space station as a follow on. Both centers were supportive in the study of how to build a space station. There was a rivalry there, no doubt about it, and a rather intense rivalry about who could come up with the best idea in a space station. There was some differences in approach to the space station. There was also some talk about maybe one center could support the other center's space station with the power system. Atomic power for the space station was a big thing at that time. Solar arrays were not that far along. The laboratories were working with dynamic engines. Marshall had a [460].

Skylab came around after this Apollo Application Program. It started off as a wet workshop. We were absolutely scandalized at the naivete. We just thought, those guys are really naive. They think that they could do anything useful with an empty tank that they were going to put out in orbit. We joined Marshall we were quite serious about it. We had some studies showing where we would build a space station. Skylab with a Saturn tank and haul it up there. It was just ever so much better. Made a lot more sense. Probably wouldn't have cost that much. But they didn't really like that idea using the tank. In order to make it useful they did a big experimented on that. They hauled that up on there. A piece of the lunar module to that, then they were going to make an automatic rocket with that thing. We thought that was kind of sporty. We kept, we would refer to it around here as a kluge. When George Mueller found out we were using that word "kluge", he was absolutely incensed. That anyone would call his wonderful idea a kluge. It was a goddamn kluge. Anyway, we finally told George that instead of a wet workshop he ought to consider a dry workshop, which would use a Saturn V instead of putting it up on a Saturn I-C. He kept saying, no, no, no you can't do that. Finally (I can remember this meeting very well) George Mueller decided that we had better throw in the towel and he went with a dry

workshop. So he had a meeting at the Cape, there was some affair going on down there. He said, get down here and we can do this thing we can also have a meeting on the Skylab. So, he got up there. Oh, by the way the north is a thing that worked. They had to make all sorts of modifications to the service module. The service module helps support this wet workshop. It was very important. We had all sorts of changes to fuel cells and all that to make this thing work. We got Rocco working on all theses changes on the service module. So, he called this meeting and announced that they were doing an awful lot of projects and there were so many more things that you could do with a dry workshop than a wet workshop. By the way we had two Saturn V's in surplus. Anyhow, so he was wanting to do those things in a dry workshop. He talks about this. Bob Gilruth got up after an hour, I don't know how he stopped laughing, for a half an hour he opposed it. He said, George do you realize how serious you are dealing with? We have been working a year and a half on this wet workshop. We have all this stuff going on and all this other work that you are going to be throwing away. He said, how in the world? He was obviously waiting for a chance to get back at George! After he sat down and Wernher got up and then we all agreed we ought to have a dry workshop. Bob Gilruth and Wernher were pretty good friends by then and I am sure that Wernher knew what Bob was doing. I don't think George stopped to realized what was going on, he wasn't prepared for that.

52. DUNAR: Do you think that it was George Mueller that kept Marshall open? Would it have closed without his support?

53. FAGET: I really don't know. I don't think, I don't think so. I really think that it was not politically a good thing to do.

54. DUNAR: More politics by Congress?

55. FAGET: Yes, not a good thing to shut them down. There was not doubt about it I think he gave them more work than maybe someone else did. For all I know he maybe very well be right. Just from our viewpoint is he seemed to be getting into our pants. But on the other hand if you divide the work up evenly, he did manage to divide the work up evenly. Which he probably should have done. He didn't close it down and divide the work up.

56. WARING: You have been an advocate of using solid rockets for sometime now, I believe. Do you think NASA stayed too long with liquid rockets through the Saturn Program? Do you think they should have initated work with solid rockets from the very beginning?

57. FAGET: We had, before we left the Langley Space Center and came here, NASA had a very good intense program. [618] and the solid occurred before the changes in administration. But, we were very enthustiastic about a big, big rocket. We made some studies which were undoubtably absolutely right. I am not sure I had very much part in it, but our force was to make great big solid rockets. And used that as a first stage [636]. What we had was a cluster of four 260-inch diameter solid rockets. They ended up firing them through 260-inch [641]. The theory on solid rockets is very significant when you really think about it. But the cheapest way to get thrust is with a solid rocket. Its not any cheaper to get your thrust with a solid rocket and what you want for the first stage is a hell of a lot of thrust when you are trying to lift that kind of weight up there. That worked. Four 260-inch solid rockets did the job.

58. WARING: Why do you think that wasn't acted on. Was it the opposition ....?

59. FAGET: The people in Huntsville didn't like solid rockets. They had no experience at

all with them. They didn't use them in their rocket system. Of course they ran the launch vehicle center, so they ... As time went by they gained better acquainted with the others, but I think the solid rockets had a very limited role.

I think the next head of the program ought to use solid rockets in the same way they developed them. The trouble with solid rockets on the shuttle is that they are complex. The charm of solid rockets is that it is the cheapest way to get a lot of thrust. If you stay with that idea, that this is the cheapest way to get rocket thrust, if you want more than a lot of thrust, then you better use liquid rockets. What I am trying to say is what you got on the shuttle is a main engine that is not all one piece.

60. WARING: Why did they become so complicated do you think on the shuttle?

61. FAGET: Well, it is simple. I am sure it was made at Marshall! Which is not completely said facetious. I think they are more attracted to complex things.

62. DUNAR: You think that is continued then on into the '70's and '80's?

63. FAGET: I don't know, but they came from a regular fuel background and the complexity.

64. DUNAR: That lends itself to complexity?

65. FAGET: I don't really know why. Well, I will tell you one thing. They did have to have PVC and that caused a certain amount of complexity. It was dictated that you build it at [717] so it did have to be safe. That created the complexity. Then the crown of complexity to that is that they decided to recover the damn thing. That was not cost-effective. The cross-over point for cost effectivity is to fly it twice. The recovery system in there take the

[733]. When you recover a solid rocket you recover only... [end of first side of tape 736].

The PVC was something that may have been good if it had been done at Marshall, it wasn't a separate PVC. Now I criticize it, but I criticized it at the time when I was in Huntsville. Solid rocket burns for a minute. [744] control operates the hydraulic system, so you have to have hydraulic pressure... The easy way to get hydraulic pressure is to carry a rather large tank of hydraulic oil, pressurize that tank and blow that into the hydraulic system. It is only going to operate so long without losing some of the hydraulic. You take the worst, on worst, on worst case situation and that hydraulic system becomes paralyzed, but we never came anywhere close to that kind of [755]. We have a ATE which is a gas turbine hydraulic pump. Very complex, we all had to [757]. The cost of that system in dollars was one thing. The other thing was getting it ready. There are launch holds because the system was not ready to operate. Like I said, I have always favored the simple approach.

66. WARING: Do you believe there had been a tendency in NASA over time to favor more complex technology? Not just Marshall but throughout NASA?

67. FAGET: And Johnson Space Center too. Marshall was not alone in this.

68. WARING: Why do you think that is? Obviously you have been fighting complexity all your life. Why is that the case then?

69. FAGET: You can always show that the more complex system is more efficient, less waste, more performance.

70. WARING: So there is a political struggle? It is hard to convince people that if you say

simple is better.

71. FAGET: The values of simplicity are never appreciated because the cost of complexity is not fully understood. The cost of complexity go into operations. You have a simple system that will probably always be ready when you are ready to go. The complex system, you have got to baby-sit it and get it arranged and so and so. The period from the total turn around time is spending more man hours and there are too many people [778]. And they all agree. A lot of this was serial time. Then there is the problem of the launch hold... The same situation applies at SSME[782]. There was a competitive approach that to that SSME in use. Most all rocket engines used a gas-generator part pump to drive the SSME. To drive the pumps...SSME used a combustion cycle which was a lot more complicated. It operates at 3,000 PSI of pressure. But because it burns a propellant in one chamber and the gas from that chamber goes through a turbine and drives the pump and then exhaust from the turbine is what goes into the combustion chamber. It has undergone a lot of pressure drops from the combustion chambers so the pump pressure has to be in excess of 6,000 pounds. In the case of oxygen, it is even higher than that. So you come out with a heavier engines, heavier pumps, you have this high-pressure dump and so forth and so on. If you look at a conventional pump-fed engine, you have to pump the pressure pretty high before you put it in a combustion chamber, because it has to go through the engine, the cooler engine (the hydrogen goes through and cools the engine) so you do have the engine pressure. But, when you get the very high pressure, the kind I am talking about, the high performance, you don't need for all of the hydrogen to go through the engine, you can get by with just a small portion. This guy at Rocketdyne [812] ... those guys came up with a neat idea. You don't have to run cold hydrogen through to cool it. You just use that hydrogen to drive your turbines to cool. You have more than enough hydrogen to cool the engines, so you can go right into pumping into the combustion chambers and that hydrogen gets burned. Consequently you could drive a 4,000 PSI chamber now that you have got this

pump pressure with a little over 5,000 PSI. The pump is smaller and a whole lot lighter and you have a high pressure chamber. Now, part of the gas was only partly burned because it went through the turbines that ...and discharged. So it was discharged at a lower temperature and you don't use your have lost it. But you save about 40% of the weight. If you use that engine, the shuttle would have been more efficient. But no one wanted to concede that this engine would weigh less and take less money to build. The great [829] at Marshall had already gotten very far along.

Anyway, we went to much more complicated engines which was hard to develop because you can't run a test on that engine separate from running one now that you have the pump, because now the whole thing has to be tested. Whereas typically on a gas-generated chamber we test the pumps separately from the testing of the combustion chamber. It was very expensive to do. It was going to be very expensive to keep these pumps running at high pressure. Anyway, that was just another complexity, another example. There is too much detail there for you to consume.

72. WARING: Is there a way that NASA could reorganize itself so that simpler more effective technology could be built? What's wrong with NASA?

73. FAGET: They ought to separate the technology development people, the research and development people from the people that do the programs. The people that ..almost to the point of becoming two agencies.

74. WARING: Have a laboratory system where people are innovating in their specialities?

75. FAGET: Yes and the other thing that should be done are that the people that are doing the actual manufacturing, it is unquestionable in my opinion, they ought to be given a bigger voice in the choices of what is being built.

76. DUNAR: Should NASA try to retool and re-develop the engineer capacity that they had before?

77. FAGET: I really don't know. I don't think that would be possible. We don't find anybody talking about turning the Post Office back into what it was. Everything has to be [857]... You know what I am trying to say is if you are going to do that, you ought to go all the way. Not half-way where you have got the program managers without the culture and the background, experienced background. This is not important to history.

78. WARING: It plays a role. NASA changed over time and that changed Marshall. It is hard to understand that without some perspective of people like yourself.

79. DUNAR: In the period that you were talking about when there was a debate over the SSME. Since Johnson had more say in that then would they would have, say in the Saturn Program, how were those decisions made?

80. FAGET: They were made at headquarters. Johnson did their best to get this other engine cycle, not a particular engine, but consideration in any cycle in the contract. But it was overruled. We were very firm. It was one of those things that everybody in Johnson wanted to do.

81. DUNAR: Wasn't the lead center concept meant to bring more autonomy to the centers. Was that system breaking down then?

82. FAGET: Yes, but if you had one center saying we will do a combustion cycle engine and you had other centers saying lets do a gas-generated cycle engine. It wasn't necessarily

a modified gas cycle. One center had all the experience in liquid propulsion systems. The program manager [886].

83. DUNAR: Was that a failing in the lead center concept?

84. FAGET: Yes, the lead center concept works up to point. The point is when they want to overrule other centers. If you want to think the same thing as the position of the lead center you have got to get them. Otherwise you might find that you are not the lead center.

It is interesting NASA is now working on an advanced launch system along with the BAB LX. I guess NASA is going to look at some [901] and do the work, the paper design work and draft at a new test site. Organizing an advanced launch system is [904] I am sure if you talked to [907] ..gas generators, someone that is so hard up... A real nice guy, Jerry Thompson. Very nice guy, very sincere. I think if you questioned him about it, he would say this is a different case. We really need that needed all of that ISP on the shuttle. We don't need it now, we need something that would work hard. Well, I thought the shuttle was meant to be worked!

85. DUNAR: You have given us a lot of your time. I appreciate your willingness to talk with us.

86. FAGET: I would like to say one thing. It has been my experience that Bob Gilruth and Werhner really were good friends and they did manage to work together probably a lot better than their centers.

87. DUNAR: That took a while to develop, didn't it?

88. FAGET: At one time Wernher managed to get the National Science Foundation to

provide us a trip down to the Antarctic. [929] for himself and Ernest Stulhinger, Bob Gilruth and me. The four of us spent about a week at the [934]. That was just before the Apollo crash.

89. WARING: Did Eberhard Rees go on that trip too?

90. FAGET: No, he was still in Europe. He went on subsequent trips.

91. WARING: I read it in the Skylab book that he made a trip and that influenced the directives he gave to people on Skylab.

92. FAGET: There were three separate trips where astronauts were there