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Bumper 8
50th Anniversary of the First Launch on Cape
Canaveral
Group Oral History
Kennedy Space Center
Held on July 24, 2000

Participants: William Pickering, Robert Droz,
Herman Bank, Norris Gray, Elizabeth M. Bain, Robert Alley,
Dick Jones, Konrad Dannenberg

Interviewers: Dr. Roger Launius, NASA HQ
Dr. Lori Walters, Florida State University

Transcription: Maria Ray
Dynacs Inc., Engineering Development Contract
Kennedy Space Center

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Approval Signature/Date Sheet

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Roger M. 3/6/2001

All redlines from all participants have been incorporated in this transcription
as of 2/1/01

1 Dr. Roger Launius: Before we get started I'd like to ask JoAnn Morgan, KSC
2 Director of External Relations and Business Development to say a few words.
3 She's a representative from Senior staff at KSC.
4

5
6 JoAnn Morgan: We consider you all a very key capture for us on the oral history
7 program at Kennedy Space Center. We are doing this in partnership with the rest
8 of people at the Cape Canaveral Spaceport and so on behalf of KSC I thank you for
9 taking the time out of the day. I know you've already had a long day but it's
10 important for the future for us to capture some of the memories of the past. We're
11 particularly looking for people in the 1950s and the 1960s now that played key
12 roles in the development of the spaceport here. I wanted to thank you. Roger
13 Launius is the Chief Historian for NASA and he and the staff here will all be
14 working with you to explain what's going to happen. Anything you need while
15 you're here, if you get thirsty or hungry again just let them know and they'll take
16 care of you. I'll be leaving you now. I just want to say it was an honor to have
17 you here today with us. We really are pleased that you have agreed to participate
18 in the oral history program. This will become part of the archives here that's
19 available for people doing research and people who want to learn about the history
20 of the spaceport and the launching activity. We're pleased that you've agreed to
21 take part in it.
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Herman Bank: Thank you.

Launius: Thank you JoAnn, appreciate it.

Bank: Nice meeting you.

Morgan: It was nice meeting all of you too. And you locals, I'll see you later.

Launius: I'm Roger Launius. I'm from NASA Headquarters and I'm the historian up there.

Bank: I see.

Launius: I'm down here -- as we like to say, "I'm from Headquarters and I'm here to help." That's why I'm here.

Launius: If nobody objects, I will remove my jacket.

Bank: If nobody objects, I'll join you.

1
2 Launius: Ok. I think we're about ready to begin. While we're getting the last
3 couple of releases, I'll explain how we're going to proceed as best I can. We're
4 going to take about an hour and 15 minutes, shouldn't be more than that. I know
5 Dr. Pickering has a tight schedule to get to the airport and it's been a long day
6 already. We'll take an hour and 15 minutes as a group to talk about Project
7 Bumper in general but especially the activities here at the Cape, we've got a series
8 of questions we would like to ask you all about that. Some of them, I might add,
9 were already answered in the presentations at lunchtime, which I'll ask you to kind
10 of repeat for our camera. Our intent is that we will transcribe these tapes, do the
11 editorial work on them that's normal, ask you all to review them and make sure
12 that you are happy with that and put those as a permanent record in the historical
13 reference collection at NASA Headquarters, over at Florida State University in
14 their Oral History Collection that Lori Walters is involved with over there. And
15 also, at the National Archives in Washington. That's our game plan. Did you have
16 anything you wanted to add, Lori?
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23 Dr. Lori Walters: No, no that's it. On behalf of Florida State University, I thank
24 you for participating in this project and giving us the opportunity to talk with you.
25

1 Bank: May I say a word?

2

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4 Launius: By all means.

5

6 Bank: We never had a historian when we first started. There was no such thing as
7 Archivists. It's quite a thing to work with them. But we're learning.

8

9

10 Launius: Well, that's good. I think it's obvious to say that you all made significant
11 history 50 years ago today. We would just like to try to capture some of those
12 thoughts and recollections at this point in time and make them a part of the
13 permanent record. I guess my first question, relates to the issue of what were the
14 origins of the Bumper project, how did it come to be? Who was involved in the
15 decision-making? What was the timing for the process of decision-making? Dr.
16 Pickering, you said some things about that at lunch. You may want to restate those
17 and maybe add to it to a certain extent. Some of the rest of you may have some
18 comments as well.

21

22

23 Dr. William Pickering: Yes. I will start out by saying that JPL had an assignment
24 from U.S. Army Ordnance to try to develop the technology of ballistic rockets. In
25 this series, we had developed a rocket which we called the WAC, which could be

1 used for high altitude scientific research. It was launched vertically upwards, from
2 a launching tower, and it had a solid propellant rocket called the Tiny Tim
3 underneath it. Tiny Tim fired and off it went. It went up about 50 miles. And so
4 we had some experience with that rocket. While, at the same time, at White Sands
5 a collection of V-2s had been brought over from Germany. I believe about 50 of
6 them.
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10 Konrad Dannenberg: Oh, it was more, almost 100. 58 were actually launched plus
11 the 8 Bumpers.
12

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14 Pickering: Yes. The purpose of those launchings was that the Army felt that by
15 conducting launchings they could understand something about the V-2
16 mechanisms and its whole technology. So, these were being launched from White
17 Sands and very quickly the high altitude scientists became interested in this and a
18 good many of these launchings then were vertical launchings carrying instruments
19 for the scientists. Now, the mating of the WAC Corporal to the V-2 evolved over a
20 period of a year or two, I'm not sure. Herman, you might know who started this. I
21 don't know if it started with the V-2 people or the JPL people.
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1 Bank: Well I know Homer Joe was sort of involved in the initial activity and
2 thoughts of the V-2 and WAC Corporal together.
3

4
5 Pickering: Yes, Homer Joe probably was.
6

7 Launius: And this was Homer Joe Stewart?
8

9
10 Pickering: Yes.
11

12 Dannenberg: I understand that Martin Summerfield and Frank Malina did some
13 calculations. Reported in an AIAA journal or whatever the AIAA was at that time,
14 (American) Rocket Society probably.
15

16
17 Pickering: Yes, Rocket Society. Yes. Malina and Summerfield had done some
18 calculations including the possibilities of satellite launchings. The WAC corporal
19 was developed while Malina was director of the laboratory. Anyway, between the
20 laboratory, the high altitude scientists, and the V-2 people, by the way, the V-2
21 assignment was primarily being handled by a contract between Army Ordnance
22 and General Electric. It was called the Hermes contract.
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1 Dannenberg: It was the Hermes contract, correct.

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4 Pickering: Anyway, the concept of mating the two evolved and this resulted in the
5 launchings first at White Sands and eventually down here at the Cape. I think the
6 significance of it was indeed, I think, the first real application of a stage rocket
7 with high altitude, high velocity, so on and so forth. And the development of
8 staging, of course, has been very important to the whole science of rocketry ever
9 since.
10

11
12 The other question would be, ok why at the Cape? You see because we were
13 happily launching them down there at White Sands. That is tied up with the fact
14 that the U.S. was interested in developing a very long range rocket launch facility.
15 There were various suggestions made. One of the interesting ones, was to launch
16 from the California desert. Straight down the gulf of California. The argument for
17 it was that you had land on both sides of the course and therefore you could put
18 instruments anywhere you wanted and this way get better coverage. That was
19 proposed but didn't get very far because the Mexicans had a very dim view of it.
20 Then the other proposal was to come out here on this coast and to use this facility.
21 And in that connection by the way, I remember Wernher von Braun commenting
22 that we had a tendency to want to pick a very remote site for a launching facility.
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1 But he said that's ridiculous. Because if the launch facility is successful, first thing
2 that happens is you get a town there. So if there's a town's there, don't worry
3 about the town. Pick the site for other reasons. Of course, this site was picked.
4
5 Incidentally there were some agreements made with the British over the use of
6 some of the British Islands for instrumentation facilities to go along with this site.
7
8 And I personally don't know of the details of what was worked out there but I
9 believe it did involve the British having certain rights to use the facilities here for
10 certain launches. In fact, they did too.

11
12 Dick Jones: If I could comment a little bit on that. When we first started in 1950,
13 the challenge was to try and get some instrumentation sites around the launch pad.
14 That was the extent of it but as soon as General Yates came down here - and I was
15 working for him, I was his Comm guy - he said we're going to have to go down on
16 these islands. And we're going to have to talk to the British. Our first trip has to
17 be to Nassau. So we went down there on an old rickety C-54 and some work had
18 already been done in Washington and with the British Embassy up there, so we had
19 the way paved somewhat. But the big question was what kind of quid pro quo
20 would we have to give the British for us to have sites on Grand Bahaman,
21 Eleuthera, San Salvador, Mayaguana, Grand Turk. And there was a lot of
22 discussion but it was a very cooperative kind of discussion. Our first station was
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1 near West End settlement on Grand Bahama. Then the big challenge was how we
2 are going to communicate with it. We had no idea. So we tried some HF radio,
3 and then what we did was we leased some lines from the telephone company from
4 Canaveral down to Jupiter. And we noticed that right across from Jupiter if you
5 look on a map is West End Settlement. So we took some old AN/TRC-1 FM
6 communications systems put them up in the lighthouse at Jupiter and then we went
7 over to West End settlement or rather near West End settlement where we had
8 started the base. And we were able to get line of sight to the lighthouse in Jupiter.
9 That was our first communication system from the Cape down to Grand Bahama.
10 But we couldn't get to Eleuthera. Each one of those islands are about 150 miles
11 apart give or take a little. So, another communications engineer by the name of
12 Free Calhoun and I got together with AT&T and we said what we need to do if
13 we're really serious about going all the way down to Grand Turk, we ought to lay a
14 submarine cable down there. Well, that went over like a lead balloon in
15 Washington and I think at the time, it was going to cost \$5 million dollars and
16 nobody had \$5 million dollars. Plus the fact that the technology in those days, we
17 had to have at least 150 kilohertz of band width to accomplish our mission. That
18 meant that about every 60 miles we had to have a repeater station. So to make a
19 long story short, we eventually put those stations at and laid our submarine cable
20 and went all the way down to Mayagisez in Puerto Rico through the Dominican
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1 Republic and that's how we got along with the British. And of course, the
2 Turks/Cayucos Islands, the Dominican Republic was probably one of the more
3 difficult agreements to cut. The Dominican Republic, as you know in those days,
4 was vacillating between dictatorship and republic and so forth. But we were able
5 to accomplish it at Sabana de la Mar on the northeast corner of the Dominican
6 Republic. That was about it.
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10 Launius: I was just handed a tape that was pulled off with a question on it. What
11 does Luac stand for?
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14 Stan Star: No, WAC, WAC.
15

16 Launius: WAC. Oh, WAC. Ok, I was going to say, I didn't know what Luac was.
17
18

19 Pickering: What does "WAC" stand for?
20

21 Jones: Without Attitude Control?
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23
24 Pickering: We started naming our research projects after the Army ranks. First
25 one, obviously, is the private, the next one was the corporal, the one after that was

1 the sergeant. And then we came along with this sounding rocket which didn't
2 really fit in the pattern. The others were getting bigger as you went along. So that
3 was named after the Women's Army Corps (WAC).
4

5
6 Launius: Ok, I should have probably done this right in the beginning but let me do
7 it at this point in time. Each of you worked on Bumper in some form or another.
8 Some of you were more involved than others. Could I go around the table, just
9 ever so briefly, and ask each of you to comment on your particular activity, that
10 you were involved in 1950 and how it related to Bumper in some form or another.
11 There's no particular order, Mr. Bank, would you be willing to talk about that.
12 Take a couple of minutes each.
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16 Bank: I was project engineer in charge of the mechanical design of the
17 WAC/Corporal and V-2 mating structure plus on the developmental subsystems
18 testing done at JPL, Arnold Air Force Base and also tested at White Sands. I
19 attended all of the shoots except one. It was a long time ago. I participated in
20 firings more as an observer more than an active person. In case problems came up,
21 that had to do with JPL equipment, we were available to help resolve the difficulty.
22 That's about it. I might give you a little history. A side history. I started at JPL in
23 '47 on this particular project after about eight years in aircraft projects, aircraft
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1 design projects. I joined JPL thinking it was a real fine place to have a temporary
2 job while things were sort of straightening out and I retired 37 years later.

3
4
5 Launius: Temporary job.

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7 Bank: And I'm still there as a volunteer with retirees. We have a group that work
8 to help hospitals on a volunteer basis.

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11 Launius: Ok. Sir.

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14 Robert Droz: There was a laboratory that preceded JPL called GALCIT. I joined
15 GALCIT in 1941. Then I joined the service in '42, but when I came back from the
16 service I rejoined.

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19 Pickering: Excuse me Bob, let me interrupt. GALCIT is Guggenheim
20 Aeronautical Laboratory California Institute of Technology.

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22
23 Launius: Right.

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1 Droz: So on my return from the service, I was introduced to the WAC program.
2 There was a WAC A and also a WAC B. The WAC A was a heavy, heavy motor
3 and the following WAC was a lightweight one. My job at the lab was just the
4 integration of any assembly that had to be done. I was kind of a hands on guy. I
5 worked with Herman. Then, we traveled to White Sands and I was there for all 6
6 of those Bumper shots doing the same thing. But there we were a little bit more
7 hands on since we fueled the rocket and attached all the attachments. Spin rockets
8 that sort of thing. By the way, there was also a WAC that was fired from the ship,
9 Norton Sound, early on in that program. And then, of course, in 1950, Herman and
10 I were here for that launch.
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15 Launius: Ok. Bumper 8?

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17 Droz: Right, and 7.

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20 Launius: Oh, ok, yes. Mr. Dannenberg?

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22 Dannenberg: I was actually not involved with the Bumper Project as such. But I
23 was in Peenemünde already and also later on in this country, responsible for the
24 propulsion system, the rocket propulsion. And actually when the V-2, we called it
25

1 the A4 in Peenemünde, when it was used for military purposes, von Braun, and our
2 military commander initially objected to the use because we still had considerable
3 problem. And we were working already on improved systems which later on
4 were introduced in the Redstone system. So the Redstone is really an improved
5 grown up V-2. This was, of course, one of the reasons that we still had quite some
6 failures in the Bumper program. The development really had not been completely
7 concluded. But of course, the military who had apparently saw that the war was
8 lost decided that in spite of these problems that I mentioned that we should go
9 ahead and do the production. So the design at that time was frozen and that's what
10 I still want to discuss with some people here. What the design looked like and
11 what the possible improvements were. So I was basically involved in the V-2
12 propellant system.

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18 Launius: Ok.

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20 Jacquelyn Dannenberg: Also, his contract to come over was for six months.

21 Speaking of temporary!

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24 Launius: Dr. Pickering.

1 Pickering: Well, I was primarily concerned with the development of the Corporal
2 program at the lab. It started out as a research rocket, but about 1948 or so the
3 army came to us and said they would like us to convert it into a production rocket.
4 So we had the problem of trying to band aid the research rocket into this
5 production rocket. I was running that project. So I was on the side lines at as far
6 as the actual WAC firings were concerned.
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10 Launius: Ok. Mr. Gray

11
12 Norris Gray: I started off during WWII as a good GI. Started off through Africa,
13 Sicily, up through Normandy, up through Germany. And I happened to be on the
14 wrong end of these V-2s. I was on the receiving end!! I said, Boy, that no way to
15 get. I said get on the sending end. Then I joined the Ordnance after I got out of
16 the service right quick. Anderson Ordnance Depot, where we were handling all
17 types of stuff up there, safety and fire and everything. Then to the Banana Naval
18 Air Station, which is when I came down here. The Navy was closing it up. So I
19 kept calling back up to the base, what's going on? They're closing up. Everybody
20 said everything is classified. Don't know what's going on. So the Navy finally
21 turned it over to the Army, and that's when I got into the V-2s. I went out to White
22 Sands and found out what they were, how they looked and how to save them. All
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1 this stuff. But that was about my story. But I still have the privilege of being at
2 the first missile on the Cape over there. Because Bumper 7, we had a lot of trouble
3 with it, misfiring. Bumper 8, went good, like a cream puff, for us. But 7 gave us
4 the trouble. We had to go out and safe it. Right now, today, you can safe it from
5 the control center. Back then you had to manual safe it and then take it back down
6 and fix it, bring in Bumper 8 and get it going. But a lot of us stayed on the Launch
7 Pad around that area for 2 weeks straight, not going home, so our families really
8 caught it back then. And then finally, we got 8 going and that started the Cape off.

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12

Launius: Ok.

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Droz: Before it slips my mind, there's a part of the crew that's not here.

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Gray: That's right.

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Droz: In those days, flit was a mosquito repellent and we had a team of people out
21 there, fellows that had a little pressurized gun, you know the hand pumps. They
22 were all over the place because the mosquitoes were absolutely horrendous. You
23 can't believe it. They aren't here now. But they were certainly a part of the crew.

25

1 Launius: We want to talk about the Cape here in just a couple of minutes.

2 Gray: One other thing, let me put a little more in since he said that. The Army
3 was down here real strong. We had the 3rd infantry division down here from Ft.
4 Benning, GA. They were the closest troops we could get a hold of. They were our
5 security around here and they did a lot of work for us. They brought in extra food
6 and everything like this at times.
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10 Launius: Ok. Mr. Jones.

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12 Dick Jones: As I said this morning, I started off at White Sands. When we got
13 there, White Sands prior to the end of the war was an ordnance test proving
14 ground. They used to test anti-aircraft artillery there and all kinds of ordnance
15 devices. So, the V-2 program was its first entry into the ballistic missile program.
16 Needless to say, going up range 75 to 80 miles there was nothing, zero. Just a
17 couple of ranches with a lot of cattle, which we were blamed for killing, maiming,
18 and causing a lot of trouble but we did stretch some communications as far as
19 Tularosa range camp. We got it done just about the time, we thought this is pretty
20 good. We got everything pretty well set. We used open wire lines, FM radios,
21 whatever we could get a hold of. They said we're going to stop here and we want
22 you to go over to a place called Cape Canaveral. So we all grabbed for a road map
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1 of Florida to see where that was. A whole bunch of us took off in army vehicles
2 with as much communications equipment as we could pack in them and headed for
3 the Cape. I remember getting into Cocoa, and I asked somebody where Cape
4 Canaveral was and they said you go across this wooden bridge and when you come
5 to the ocean, you hang a left. I said something about the Naval Air Station and
6 they said well then you got to take a right when you get to the ocean and you go
7 through a little town called Cocoa Beach. There'll be a little fish & chip place
8 there called Fishers, when you see that you keep going south and then you'll hit the
9 base. That was my first entry here. From then on, we tried to accumulate as much
10 equipment and requirements as we could. I was working very close with Karl
11 Sendler who was your countryman from Peenemünde. He and I worked at White
12 Sands to get the required communications that we could together, so he and I
13 worked out here together before he went back to Huntsville. But we started off, for
14 the bumper launches we had communications cables laid from the launch pad,
15 where we were this morning, back to the loosely called blockhouse and then back
16 to some communication points where there were some cameras, and telemetry
17 receiving station, and a radar. Then we also had to run some wire lines over to the
18 lighthouse because that's where Dr. von Braun wanted to be when it was launched.
19 And that pretty much constituted our initial support of communications for the
20 bumper. We also had some interference control vans that we built up in Fort
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1 Monmouth, NJ and trucked down here to check all the frequencies because we had
2 no idea what kind of interference we would encounter with the frequencies we
3 were using, in those days 30 – 36 MHz . The DOVAP system and telemetry in
4 those days were in the 30 MHz range and up to the 210 MHz range. So we didn't
5 know what we were going to encounter. We encountered taxi cabs from Houston
6 interfering with our command destruct systems but we had a good time. We had
7 no idea that anything was going to happen beyond that point. We figured they're
8 going to shoot these things off and they're going say the mosquitoes down here,
9 and the rattlesnakes and alligators and are too much to endure it. We have to leave
10 here and go someplace else. But we didn't leave we stayed, I'm still here.
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15 Launius: Mrs. Bain, how about you?
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18 Elizabeth Bain: I know that most of us have said sometime or other, "How did I
19 ever get in this spot?" Well, I started out being a civil service person from the
20 word go right after Pearl Harbor. I worked at Ft. Monmouth and when the Air
21 Force was being activated, they asked me to come over and help them start that.
22 So I was a placement officer over there. Well, a few years later they decided that
23 Watson Labs where I worked was going to Rome, New York. So here I am a
24 divorcee with two small children and I didn't want to go to Rome, New York,
25

1 because I lived in New Jersey. And I thought that was the end of the world, to go
2 up in the cold country but anyway about that time, I was given the opportunity to
3 recruit engineers and any kind of person like a stenographer, librarian, and all of
4 them to try to come down here to Patrick Air Force Base. Of course, it wasn't
5 Patrick at that time. Well, I guess it was. But anyway, I was recruiting all over the
6 place because it was hard to find people, you know right after the war. So anyway,
7 since the whole unit was going to Rome, New York, I decided, heck with this,
8 instead of me recruiting people to come to Florida. I was going to go there myself.
9 So I went to this officer, Lt. Col. William James - Army, and got a job and that's
10 how come I got down here. But my job was to try to get people to come to Florida.
11 Along with myself, we came down here and there were many engineers and other
12 people that came too but they didn't like it so they went back to where ever they
13 had come from. It was really horrible to try to get people to work here. I didn't
14 work in Personnel at Patrick. I worked in the section where Dick was working and
15 I was writing job descriptions like crazy trying to hire people to come to work. I
16 wasn't in Personnel now, remember, it's an operating section. So nobody was
17 coming so what are they going to do. About the time they said ok the Bumper is
18 going to go off, we don't care what happens. My boss, Col. James, called me in
19 and said you, you, you are going to work up at the Cape. To me, that was one of
20 the goofiest things I had ever heard of. So away we went. The Army would pick
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1 us up at 2:00 – 3:00 in the morning and we would ride up to the Cape in the back
2 of Army trucks. And there were so many big rattlesnakes that we would encounter
3 that the big trucks didn't really go over them, you know, didn't kill them. They'd
4 have to put the brakes on and go over the things. So we got up there and there was
5 no place to eat, no place to get a drink of water, no nothing, no bathrooms, so what
6 are we going to do. I worked in this rinky dinky little Interference Control van
7 reading the radars. And it was so hot in there, imagine this time of year, it was just
8 terrible. So these little GIs in this rinky dink van said ok we'll fix you up. So they
9 hooked up a long extension cord and here I was sitting out by the missile, could
10 almost put my feet on the thing while I was reading these radars. So we were out
11 there watching all the interference with the trucks that were going by and the
12 planes and maybe submarines out there that were watching what we were doing.
13 This lasted for two weeks. Well, my family was having a fit because I wasn't
14 home. And we stayed up there 16 hours a day and this lasted until I thought it
15 would never end but anyway it did. So finally, we did get the stupid thing up. Not
16 the stupid thing. But it did go up, it went up and came back down again. It was
17 nice to be able to actually get it up. We didn't know what we were doing except we
18 knew that thing had to go up. So when we finished and went back to our old jobs,
19 every body said, "Thank you" and that's it. Then I started writing job descriptions
20 again trying to get people to come to work which is a job. Any way that's it.
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Gray: I think you forgot to tell them about some checks.

Bain: Well, that was later. That was much later.

Gray: You kind of helped out some people.

Bain: Right, I'm not going to get into that!

Launius: Mr. Alley

Robert Alley: I have, perhaps, a different story. I graduated from the University of Michigan, 1949, went to work for General Electric. Then the U.S. Army had different plans for me, and in late 1950, they decided I should enter basic training at Fort Dix. Well, fortunately, after completing that, I was in the office where you could select where you wanted to go after basic training. And since I really hadn't been west, I decided, you know this White Sands thing might be interesting. So I went to White Sands and got involved with the V-2. We were in the Army group that took over from General Electric and their project that built and fired the last V-2s. So I can say he did the first ones (indicating Dannenberg) and I did the last

1 ones. We did a project for von Braun as part of the carbon vanes for the new
2 rocket and we bolted the two V-2 tank sections to side of the mountain. The desert
3 was 90 feet below the rocket engine we also bolted in there. I remember, I was
4 reaching for my canteen while we doing this work and here was a scorpion sitting
5 right next to my canteen so I put off that drink for a little while. The other
6 memorable thing from that occasion, when we finished the test for von Braun, who
7 came to see this done. I met some of the other men and I don't remember you
8 unfortunately (indicating Dannenberg), Rudy Beichel I do remember. After we
9 finished the test we had oh several hundred maybe a thousand gallons or some
10 quantity of liquid oxygen and alcohol left in the tanks. It was a weekend coming
11 up, and the GI Fire Department from the base would have to stay there if there's
12 going to be propellant in the tanks. So we decided, well, let's just run the pump
13 and dump fuel down ninety feet and let it crash on to the rocks, pour water on it
14 and go home for the weekend. No EPA then. So we did. About three months
15 later, I was sitting in a meeting where this Bureau of Mines man was talking about
16 shock detonation of mixtures of liquid oxygen and alcohol. I have no idea what
17 the rest of the meeting was about.
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24 Launius: Ok.
25

1 Alley: So anyway, we finished off what he started.

2
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4 Launius: Some of you have already commented on this but I would like to get
5 your larger impression. What was your first kind of impressions of Cape
6 Canaveral? I've heard rattlesnakes, alligators, mosquitoes

7
8
9 Bain: Scorpions.

10
11 Launius: Scorpions!

12
13
14 Alley: Scorpions too? Oh, wow.

15
16 Bain: Oh, yes.

17
18
19 Jones: Big ones.

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21 Launius: I'm sorry?

22 Jones: Big ones, scorpions, big ones.

23
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25 Alley: Oh, wow. This was only that big (size indicated by fingers).

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Bain: The ones that curl their tails up.

Jones: There's the mark of one (indicating his hand). The scar.

Gray: Don't forget the coons. Raccoons were all over the place. They'd get in the instrumentation, they get all over the place.

Launius: That's interesting.

Bain: Deer.

Bank: I can start that.

Launius: Ok.

Bank: When we came to Cape Canaveral it was a desert wasteland. Bushes and greenery, here and there. A lot of animal life, as you say. It was really a, like you say, a wasteland. The pad was the only thing that was there that seemed artificial. A 50-foot pad and then off to one side was a tent, and that tent was for of military

1 security that we had. They stayed there day and night to protect the rocket, I think
2 from the animals. In any event, the story went that the military security would
3 sleep at night in the tent and they would wake up in the morning and here were a
4 bunch of rattlesnakes sleeping beside them in the tent to keep out of the cold. It
5 was quite cold at night at that time.
6

7

8

9 Bain: Right.

10

11 Bank: I do remember that. It was a real experience, out in the middle of the
12 wastelands of Florida.
13

14

15

16 Launius: Now, where did you all stay? You were talking about getting on to
17 trucks at 3:00 in the morning roughly.
18

19

20

21 Bain: Right.

22

23 Launius: Or 2:00 in the morning and coming down here. Did you all stay in
24 quarters that were some other place? Did Titusville even exist?
25

26

27 Droz: BOQ.

1 Launius: There was a BOQ?

2

3

4 Droz: That's where I stayed.

5

6 Jones: Second floor, hangar 751.

7

8

9 Bain: I lived at home.

10

11 Jones: That was our spot.

12

13

14 Bain: I lived at home in Melbourne. First I lived in Cocoa Beach, I had no place
15 to go, I didn't know that there was no housing when you came to Florida. So this
16 gentlemen, Bill Wrye one of the engineers that worked for my boss, who I had
17 been interviewed by, said, "Here are the keys to my house. You can live in my
18 house until I get down in Cocoa Beach for several months". So, thank heavens,
19 that's the only way that I did. I lived in his house until I found a furnished
20 apartment in Cocoa Beach. But in the meantime, the Korean War was starting and
21 there were people having to go to that, so one of the telephone repair man in my
22 office said, look if you're looking for a house, which I was desperately looking for
23 a house. He said listen, My boss, Major Kirby is being called up to the Korean
24
25

1 War and if you call right quick and go see his wife maybe you can get that house.

2 So that's how come I moved to Melbourne. But it was a shock to the children.

3 Because with them coming from New Jersey, their education was far advanced
4 from what it was in this particular area. And I guess it took about two years for
5 them to actually have to sit down and study. Until, finally, they got a good person
6 by the name of Dr. Frank Brown who came to the Melbourne school and got it
7 straightened out as one of the best ones in the country at that time. But it was hard
8 for kids.
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13 Bank: We stayed in old abandoned barracks, which they cleaned up and tried to
14 close up the windows and things like that. They were creaky and a little bit
15 primitive but they were quite comfortable. A number of us stayed in those
16 barracks. Part of the guests of the WWII Air Force base that was around at that
17 time.
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19

20 Launius: Ok.

21

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23 Droz: We did all of our work at Patrick.

24

25 Launius: Down at Patrick.

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Droz: Right.

Launius: Was that facility well-developed by that point?

Droz: I don't really remember. There are certain things I remember very well and others that I don't.

Gray: You know where the Officers Club is right now?

Launius: Ok.

Gray: At present? South of that they called Silver Beach. There was about nine houses down there. They're all built of wood and they were going to move me in the second house there. I went to open the front door and it all fell off. The commode was kind of tilted to one side and one of the Navy guys came up to me and said, "Sir, you know you're in trouble?" I said, "No." He said, "Rapid oxidation has got you. You know, rust." (laughter) But even the main gate down at Patrick, where the main gate is now, some of us went down there to try to open that thing and the galvanized looked beautiful. You wouldn't think anything was

1 wrong with it. The galvanized was perfect. But all the metal on the inside of
2 everything was eaten up. And it just fell over. But the Navy had some houses
3 down in Melbourne back in there and they also had some houses up in Rockledge.
4 And I asked the Navy Commander, I said, how come you had houses back there.
5 He said, well, we didn't like what was coming up on our beach at night sometimes,
6 so their families a lot of them moved back over towards Rockledge or Melbourne.
7 And some of us moved down, I moved in Melbourne down there in the Navy
8 housing then, we had that.
9
10
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12

13 Launius: Ok. Lori Walters, did you have questions about the local area?
14

15 Walters: Yes, I'm just curious about recreation and shopping facilities here at that
16 time. What did you do during your off hours?
17
18

19 Bain: If you're asking me, the only thing that we did as far as shopping concerned,
20 if we needed like a white tablecloth, you would find a green one or a red one but
21 you couldn't find what you really wanted so all of us shopped in Orlando on
22 weekends. We'd take off and away we would go. And I'll say one thing for
23 Melbourne though, they had a little newspaper, the Melbourne Times, that
24 concentrated on the people that were coming here. And they had big spreads about
25

1 different one of us that had come from different states. And they were very good
2 about trying to integrate the rest of us into their facilities. Which was very good.
3
4 And the churches, they even gave my daughter the keys to their church, so she
5 could go practice her piano. I mean, it was very friendly place, it was nice, after
6 you actually got there.

7
8
9 Walters: And the people, the locals, that were already here were very friendly?

10
11 Bain: Very good in Melbourne.

12
13
14 Gray: Oh yeah.

15
16 Bain: Very good.

17
18
19 Gray: They were actually glad to see us come in, I think. The name of that paper,
20 Liz won't tell you but I will, was called the Mullet Wrapper.

21
22
23 Launius: Makes perfect sense.

24
25

1 Gray: Because Mullet Wrapper, a lot of fish called Mullet back in those days.
2 And this is what they wrapped the fish up in. So the paper was called Mullet
3 Wrapper. I think some people still call it that today.
4

5
6 Droz: I stayed at the BOQ. I have a receipt from there.
7

8
9 Launius: Oh you do? (laughter)
10

11 Gray: Three dollars for four days, wasn't it?
12

13
14 Droz: I paid \$15 that was the end of July.
15

16 Walters: What did you do to unwind, when you had some spare time?
17

18
19 Gray: Drink! (laughter)
20

21 Droz: There used to be a steak house that I remember. But I don't remember
22 where it was exactly. Do you?
23
24
25

1 Bain: Well, yes, it was Fishers, in Cocoa Beach. But in Melbourne all of us would
2 stay together that came from like New Jersey or New York and we had little parties
3 and things together. So that we were able to actually have a little social activities
4 with our friends that we knew. But we always ended up in a bar because we were
5 all used to going to bars in New York and New Jersey. And down here we were
6 frowned upon. They thought we were different.
7
8

9
10 Droz: Wasn't Bernard's open?
11

12 Jones: Yes, It was just a fish and chip place, like a drive in. Bernard was trying to
13 get it going and he had one bar. He had a bar and a little pick up counter for fish
14 and chips and a couple of little tables. That was it. Of course it's expanded now.
15
16

17 Bain: And the floor was just sawdust.
18
19

20 Jones: Yeah.
21

22 Dannenberg: As I said earlier, I was not here for the actual Bumper launch but I
23 spend quite a bit of time there launching Redstones, which came really soon after
24 that. At that time the situation was still pretty much the same. I was not on the
25

1 launch team. Debus came here, a week or so before the launch with a handful of
2 people. And I know they had problems with staying at places. And eventually
3 stayed at government quarters. Probably in the Melbourne area and when the final
4 observers came down, von Braun and the entire team to evaluate the launchings we
5 stayed in Melbourne at the club. And I don't remember the name of the club
6 anymore.
7

8
9
10 Unknown: Trade Winds.

11
12 Bain: Oh, Trade Winds.
13

14
15 Dannenberg: Trade Winds, yes. And again
16

17
18 Jones: Marty Maguire's Trade Winds.
19

20 Dannenberg: Whether they were successful launches or delays, we had to spend a
21 lot time at the bar.
22

23
24 Bain: Right, that's true! (laughter)
25

1 Dannenberg: We could not stay anywhere in Cocoa, Cocoa Beach. There were a
2 few small places which rented rooms but not enough for a larger number of people
3 to stay. So we always had to stay in Melbourne.
4

5
6 Bain: Right!
7

8
9 Dannenberg: Trade Winds right, that was the name. They had a nice big
10 swimming pool...
11

12 Bain: and the casino.
13

14
15 Jones: That was in Indialantic.
16

17
18 Dannenberg: Is it still there?
19

20 Jones: No, they tore it down.
21

22
23 Launius: Why don't we talk a few minutes about Bumper itself. Here is one of
24 the questions I would like to ask you all. The launch took place just a month or so
25 after the Korean conflict began, the Cold War was heating up, there's been several

1 struggles that have taken place thus far relative to the Soviet Union - the Berlin
2 Blockade, the airlift, so forth. What was your sense about what was taking place
3 around you and your place in helping to resolve some of those issues. Did you see
4 what you were doing in any context as being Cold War activity? Or were you
5 doing something else? What were you doing if there was something else?
6
7
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9 Dannenberg: Maybe I can add a few words to what Bill said earlier.
10

11 Launius: Yes, please.
12

13 Dannenberg: The White Sands proving ground has of course a limited range. It's
14 about 50 miles wide and 100 miles long. So we could not launch the V-2 straight
15 up. We had to launch them straight up, we could not launch them over the
16 distance. And of course, the same thing was still the situation when the Bumper
17 program started. The Army also became concerned because one of the V-2s had
18 not been tilted in the proper direction some how apparently some one connected
19 the guidance system the wrong way and it went the other way and came down
20 towards Mexico. That was the first missile attack by the U.S. on a foreign country.
21 That of course created a lot of negotiations and operations and I think the Army
22 was really concerned that these two stages now, they could easily leave the range
23
24
25

1 for a long, long stretch. They were really honestly interested in a long range
2 proving ground. That's why they were looking for the Bumper launches here.
3

4
5 Pickering: Yes. The motivation for launching when they did, I'm sure was related
6 to the fact, that the U.S. needed a long range proving ground and here's the first
7 thing they could do to start it. As far as the Bumper, itself, was concerned, I don't
8 think anybody looked on that as a military device of any sort.
9

10
11 Dannenberg: Initially it was strictly a scientific means of getting to greater
12 altitudes.
13

14
15 Pickering: That's all.
16

17
18 Dannenberg: I understand that Summerfield and Malina had calculated that we
19 should be able to go up 600 miles, though we never made that. We made 350 or
20 so, I think. Also, the range would have been an order of magnitude greater. So the
21 range would have been longer than what we did with Bumper 8 and 7.
22

23
24 Gray: But when that missile did come down, it hit in a good place.
25

1 Dannenberg: Yes.

2

3

4 Gray: It hit the graveyard.

5

6 Dannenberg: Yes.

7

8

9 Launius: Bumper 8?

10

11 Group response: No, No.

12

13

14 Group response: Juarez

15

16 Jones: Bumper 5, wasn't it?

17

18

19 Gray: Bumper 4 or 5, I'm not sure.

20

21 Dannenberg: I don't think it was a Bumper. It was a one-stager.

22

23

24 Pickering: In fact, I think it was the first V-2 launching. Wasn't it?

25

1 Dannenberg: No, it was a little later. It was one of the earlier ones. We were still
2 responsible.

3
4
5 Pickering: Yes.

6
7 Gray: But it did come down in a graveyard.
8

9
10 Dannenberg: I understood the Mexicans sold so many souvenirs that we could
11 have built 3 Bumpers.

12
13
14 Gray: Oh yeah! I understood that they got so mad at us for starting that. You
15 know we just got through with WWII. What are you guys doing?

16
17
18 Jones: A lot of the Mexicans affected went to church for seven days in a row!

19
20 Gray: There you go.

21
22
23 Jones: That's true!

24
25 Gray: Yes.

1
2 Droz: I think Bumper 5 was the most exciting one. I was in a blockhouse on site.
3
4 We're not talking about Florida. But, it was a perfect launch from White Sands.
5
6 The Doppler antenna was split and when the WAC began to slow down, as it
7
8 reached 200 or 225 miles, and was still coasting, you can then begin to hear
9
10 Doppler. It became kind of like a wee waw, wee waw. It was the strangest
11
12 sensation to hear that. As it stopped and began to fall backwards, it picked up that
13
14 sound again. It was audible. Really thrilling.
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20 Bank: It was one of the Bumpers and I don't recall which one it was, but some
21
22 how or other went off a little bit in the wrong direction. There was a lot of concern
23
24 that it might be Mexico-bound or something like that. Everybody was told to be
25
26 quiet. Bumper disappeared. And, about three months later, a farmer found it some
27
28 where in New Mexico or something, I don't know the story accurately.
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32 Bain: Right.
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36 Jones: A rancher!
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40 Bank: Yes.
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Jones: His name was Dwight Spencer, he was on the Spencer ranch.

Bank: How about that, how about that.

Jones: If I recall it.

Bank: He told us he found this debris in his back yard and wondered what we wanted to do with it.

Droz: The cowboy was named Kennedy.

Jones: Was it?

Droz: Yes, I met him and picked up the debris.

Jones: An interesting comment about the V-2s at White Sands. Karl Sendler and I became good friends, I'll try to quote him. He said to me one day, (in German accent) "Dick we are going to install on the tail fins of the V-2 something called heliograph and when it goes up, it'll take a picture of earth. Up at the top, it's

1 going to kick out and you guys got to go find it.” (laughter) Well, we searched
2 that desert from the San Andres over to the Sacramentos and we never could find
3 it. I had a young corporal working for me and after we’d been out in the desert for
4 about 8 hours, sweating, and trying to find this thing. He said to me, why don’t we
5 paint them with luminescent paint and look for them at night. So we had a couple
6 of L-5 airplanes and when they did that again, we had a pretty good idea where
7 they landed and we went over there at night and the guys in the aircraft said, it’s
8 down there, we can see it shining. We drove over and there it was!
9
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13 Bank: We talked a little bit about entertainment.
14

15 Launius: Yes.
16
17

18 Bank: With the mention on the early conference you had. But that’s one thing that
19 I kind of appreciated a different sense. When we had a successful launch here or
20 whatever we went and celebrated with GE at a beach resort, a very lovely banquet
21 and so forth. The difference that we probably had in White Sands was we had a
22 Juarez, so when we launched it, good or bad, we went to Juarez and either enjoyed
23 it or drowned our sorrows with the Margaritas and the local entertainment.
24
25

1 Gray: Tequila!

2
3
4 Alley: That is very correct. (laughter) Sometimes in between.

5
6 Bain: We had a problem here with trying to keep people together because we all
7 came from such diverse ideas and places, that with the civilians we tried to have a
8 civilian association. So I started back with the friends that I knew in New Jersey
9 and Watson labs, we got copies of their by-laws then we modified them to the
10 point were we did start a civilian association. How they picked the people that
11 were going to be on that board was by different sections. So, they would take a
12 vote on everybody, so everybody was selected to the Patrick Civilian Association
13 and I think there was about six of us that finally ended up on the board. We had a
14 little party to try to keep people together down at the Casino in Melbourne Beach
15 where we all had a good time. But it was a problem. Just couldn't keep them
16 together.
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21 Launius: Dr. Pickering talked earlier about the issue of mating the WAC Corporal
22 to the V-2 and doing two stage rocket. Trying to reach the highest altitudes
23 possible through that process and of course, as we all know, staging is how we've
24 been doing it ever since. There's a lot of people who want to do single stage orbit,
25

1 believe that's the technology that's around the corner but we're not there yet. The
2 kinds of activities that you were involved on with the Bumper project, did you
3 envision, at any point, while you were working on this, that we were really looking
4 at space exploration and 50 years down the pike going to the moon and off to the
5 planets and so forth. Was there that vision that was a part of the team? Or any
6 members of the team?
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10 Pickering: Yes, I would say actually in the immediate post-war period, there were
11 several groups that were studying satellites, the Rand Corporation has a satellite
12 report on one of those very early reports. JPL has one on very early reports and of
13 course Wernher's people were also doing this same sort of thing. All of these
14 proposals of course, all required multi-stage rocketry, so the multi-stage problem
15 had to be solved. In principle it sounds very simple but as usual, real life
16 engineering isn't quite as simple as it looks when you first look at it. So, therefore,
17 I think, the Bumper WAC was an important contributor to this.
18
19
20

21 Bain: After that team, the Matador.
22
23

24 Pickering: Yes.
25

1 Bain: And that was a different concept too.

2

3

4 Gray: It was different, yes, completely.

5

6 Bain: Yes, completely.

7

8

9 Pickering: Yes.

10

11 Droz: Before this, we knew nothing about starting electric motors in rarified
12 atmospheres. One of the WACs fuel, aniline and the oxidizer red fuming nitric
13 acid were fuels that immediately ignited, a hypergolic reaction.
14

15

16 Pickering: Ignited on contact.

17

18

19 Gray: That's right.

20

21

22 Droz: One of the WACs had reached an altitude where upon the uncontrolled
23 vaporization caused the engine to blow up. So thereafter, there was a plate soft
24 soldered to the exit nozzle of the WAC motor which retained atmospheric pressure.
25 After that, ignition was right.

1
2 Dannenberg: One of the questions was separation which, of course, when does the
3 rocket separate? Theoretically, and I think that's what Summerfield used in his
4 calculations, if you immediately have to shut off your first stage and turn on the
5 second one, you have the best performance. You gain quite a bit in performance
6 but that is difficult to do. I think eventually, it was done that you waited a few
7 seconds and of course you lose velocity at that time and with that you lose
8 performance. Then you ignite finally second stage a little later after complete
9 separation. And that's basically, the way we do it today. So in a way, we learned
10 it at that time. That that's the best way to do it, although you lose a little bit in
11 performance. But you often have to give up performance to gain safety.
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16 Bank: The Explorer 1 followed the Bumper WAC, didn't it? Shortly afterwards,
17 yes. Next
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20 Pickering: the Explorer was 58 and the WAC was 49 or 50.
21
22

23 Bank: Anyway, I was going to say after Explorer 1 we really got into all sorts of
24 interplanetary type of things. We had studies going on for, I guess, actually work
25

1 with von Braun's group a seven rocket project to go to Mars, as I recall. Do you
2 recall that, Bill?

3
4
5 Dannenberg: von Braun worked on the Mars project in Fort Bliss.

6
7 Unknown: Right.

8
9
10 Bank: Yes, seems to me that was somewhere along the line there. We did a fair
11 amount of rocketry at that time.

12
13
14 Pickering: As from the point of view again of the multi-stage rocket, the re-entry
15 test vehicle program which we had with von Braun was of course, two stages on
16 top of the Redstone and that worked out very well. The problem that von Braun
17 was trying to solve was the reentry problem that if you come in at very high speed,
18 how do you design a nose. What do you design so on and so forth. At this time,
19 von Braun was working on what was called an IRBM, Intermediate Range Ballistic
20 Missile, about 2,000 mile range and he had to solve this problem and so we used
21 the two stage solid propellant system on top of a Redstone to get up to sufficient
22 speed to perform this kind of a test. I forget how many were fired now, there were
23 several of them though that were RTV tests.
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Dannenberg: No, I think it was about five.

Pickering: Yeah, something like that. It was very useful information.

Dannenberg; If you put one extra little stage on top of it then you can make the Explorer launch. Von Braun had proposed that way before the Russians launched their Sputniks but Eisenhower turned it down and so he was very upset that he could make these other launches without going into earth orbit. That's why finally the Explorer is very often referred to as "Jupiter C". It really was no Jupiter. It was done for the Jupiter project that's where the "C" comes in, "configuration". But the basic launch vehicle was a Redstone.

Pickering: Right. There was a concern that you might accidentally put it into orbit. General Medaris said, he really didn't want to hear about accidentally putting one into orbit.

Jones: Was the Redstone on the Explorer the same engine as the regular Redstone?

1 Pickering: It was beefed up.

2
3
4 Dannenberg: For the Explorer was a little beefed up. Even the propellants were a
5 little bit better. The Redstone used 90% ethyl alcohol and we used an aniline type
6 mixture which burns a little bit hotter and in a way, I'm still happy today that we
7 didn't have a mishap due to that situation. But it was basically, the same, the
8 design of the engine was the same.
9

10
11 Jones: Ok.

12
13
14 Launius: In terms of Bumper, what was the most, and I may get entirely different
15 answers from each of you, what was the most difficult technological challenge you
16 all had to overcome. Any thoughts on that?
17

18
19 Bank: I hoped the damn thing worked! (laughter) Amen!

20
21 Gray: Biggest difficulty was Bumper 7. The valve froze up on it.
22

23
24 Droz: Any launch that you're successful with, you get a basket full of data but the
25 lessons are learned when you have a failure.

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Gray: That's right.

Jones: I think from the support standpoint, our biggest challenge was doing something with the Cape. There was nothing there. There was one telephone line from the lighthouse down to the City of Cape Canaveral. That was it! I walked into that place, and they said, there's going to be a launch pad here, going to be this over here, going to be this over there. Hook it all up! We had nothing really to do it with. We had to get on the horn and call Fort Monmouth and we got some cable equipment from Warner Robbins, GA. We had stuff coming in like mad as fast as they could get here. Of course, today, the network of communications on the Cape is unbelievable. (laughter) There's underground cables all over the place, and conduits and there's microwave there's all kinds of radio systems. But in those days there was zero! Nothing!

Pickering: Sometimes we forget how elementary these things were. For example, at the time of the Explorer, 1958, von Braun, Van Allen, and myself, were in the Pentagon and our communications with the Cape was the commercial telephone line. One telephone plus one teletype and that was it.

1 Bain: Well, from my standpoint, I hear people talking about going through the
2 blockhouse. First, we were concerned there was no blockhouse, all we did was run
3 out into the woods. (laughter)
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6 Gray: And then if you wanted a telephone, you generally go to this guy, and pick
7 up a roll of wire, string it out and what double E 8 phones?
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10 Droz: Yes, double E 88, right .
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13 Gray: Hook a double E 8 phone on, crank it up, and have some other guy hold the
14 other end of the line, he got shocked, the line worked, and plug his phone in!
15 (laughter) We did all the phone lines as long as he gave us the double E 8 phones.
16

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18 Droz: This is besides. This is rather interesting. I happened to be in Las Cruces
19 one evening and we were sitting at the hotel bar, Dr. Van Allen, who was well-
20 known for his contributions, and a Navy commander. The three of us were sitting
21 in the bar. The bartender said, how come commander why are, he didn't call him
22 commander, what are you guys doing out here, the Navy? Are you interested in
23 having launches? And he said, no we're really going to bring a cruiser up the Rio
24
25

1 Grande and we'll be firing from there. That was it. (laughter) The town is small,
2 and the word got around...and all that.

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5 Launius: We've got about ten minutes or so left, I'd like to ask each of you about
6 your most significant memory from the Bumper Project. Specifically, Bumper 8,
7 which is the successful launch from here. And what you recall most after fifty
8 years of that particular project. There's no particular order, I can go around the
9 table if you like. Or you can chime in, feel free. I'll throw that one out.
10

11
12 Dannenberg: Maybe you should be the first one. (*Pointing to Pickering*).
13

14
15 Pickering: I would say because of this launch at the Cape. Because it was a very
16 important step as being pointed out in wilderness here. Of course, you all know
17 the story about what's his name, the science fiction writer.
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20 Dannenberg: Asimov
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23 Unknown: Arthur C. Clark
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25 Launius: Jules Verne?

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Pickering: Jules Verne, right. He wanted to make a moon launch from the Cape. This was written in the late 1870's or thereabouts. He said the Cape is too inaccessible, it's ridiculous, you can't use that. So he went over to Tampa and launched his moon rocket. In 1950 it wasn't much better. But I think the important thing is that the decision had been made that the country needed a long range proving ground and this is, really a start to implement that decision.

Bain: We knew that it was important and we were very glad to make sure that we were part of it and that it was a successful launch. Because it was a trying ordeal to try to get that thing off. But it was a very good example to all of us that at least we could do something.

Launius: Any other thoughts?

Droz: I'm not a visionary and the Bumper project was not a dream of mine. Nor was I on the committee that chose Cape Canaveral to be a great place to launch rockets. Because it was a job. And one that I was excited with but at the time of the launch we were just glad that it worked and other than that just the excitement

1 of being here and seeing your work completed, I think that was a great day for me.

2 But I didn't see anything beyond that. Really.

3
4
5 Alley: This is perhaps, slightly off-side. Young enthusiastic graduate coming into
6 this business, if you will, we could see that the Germans had accomplished so
7 much in such a sort time that it must have scared the pants off our military
8 planners. And so, as being part of that, we could see that perhaps we would be
9 involved with something bigger. Perhaps we expected things to go to the moon, to
10 Mars and to other places, including people to happen much faster than it has. But
11 again to reflect what I've said a number times, being a draftee in the Army, doing
12 this stuff, it was the most exciting engineering job I've ever had in 42 years of GE,
13 but the lousiest pay. (laughter)

14
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17 Gray: Thank you draftee! Well for me, Bumper 8 is truly the embryo of the space
18 industry here. Truly the embryo, started it all off. That's why we continue today
19 to keep going. But I was sure glad that left because I was here two weeks straight,
20 a lot of people were, I actually got pictures back then. I slept on the launch pad on
21 the top of the right hand corner. The 3rd Infantry Division kind of protected me so
22 someone didn't run over me. But they knew where I was in case something came
23 up. But I stayed two days after the Bumper launch 8 went to clean up to see if
24
25

1 there were any fuels we dropped or anything like that to make everything safe. We
2 thought maybe they were going to bring Bumper Number 9 but we didn't launch
3 another.
4

5
6 Launius: Any other thoughts? Do you have any? (to Lori Walters) I will defer to,
7 where is he? He stepped out. Stan has lots of technical questions he would like to
8 ask, we're going to have to hold those, I think. I guess just to bring this thing to a
9 conclusion, one final quick question, the team I think was fairly small that worked
10 on Bumper in comparison to the teams that would exist a little later on, certainly
11 with Project Apollo and even with Shuttle. In terms of the complexity and so
12 forth, are there any kinds of systems engineering concepts that you all practiced
13 that you think might be useful that the next generation of engineers need to hear
14 about from pioneers who were here, present at the creation basically. If there is
15 anything like that, can you offer any, any observations along those lines? If there's
16 not at this point, we are going to press you all individually at some point to talk to
17 some of these ideas.
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23 Dannenberg: It depends a little bit about what you mean about with the team. If
24 you talk about the launch team you're certainly correct, it was a relatively small
25 group of people who did it. On the other hand, to lay the foundation for that, of

1 course, people had to work on the V-2, which involved several thousand people in
2 Peenemünde. Even in White Sands, I think we had a pretty good, strong team.

3
4 The Germans were there, 30 were permanently stationed there. We had to back up
5 from the people in Fort Bliss. I was in Fort Bliss myself. Malina and all his
6 people, he had quite a team at JPL also. Then of course, we had a lot of GE people
7 to put the two things together. We needed the Army to transport them eventually
8 from White Sands to the Cape. So if that's what you include in the team, it was a
9 pretty large number of people.
10

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12 Launius: Ok. Thank you. Any other comments?
13

14
15 Gray: Another big thing we had trouble getting was fuels in this area. You'd call
16 the liquid oxygen people in Tampa and tell them bring it to the Cape, they didn't
17 know where the Cape was. It would get lost and back then the tankers didn't hold
18 the liquid oxygen too good. Evaporation, quick. They'd get here with half a tank.
19

20
21 Launius: Ok. I think with that we should draw to a close. One last question.
22

23
24 Walters: I've been looking at photographs of the gantry here at the Bumper pad
25 and one of my questions is where did the launch material come from? Where did

1 the scaffolding come from? How did you get it here? And how did you put it
2 together? It looks rather complex.

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4
5 Gray: The scaffolding is painters scaffolding.

6
7 Walters: It was local?

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10 Gray: It came from an outfit in Orlando, they brought it over to us.

11
12 Walters: So it was something that was manufactured here in Florida?

13
14
15 Dannenberg: That's pretty simple.

16
17 Gray: We ordered painters scaffolding through and then stacked it up and said
18 that's all we need, we reached the top of the missile. So you had one scaffolding
19 here and one over here. You had two separate deals. And everybody got together
20 and pushed it together around the missile and we did it the same way back and
21 forth. But everybody worked as a team. Regardless of who you were, you helped
22 push that scaffolding just right.
23
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1 Dannenberg: And to transport the V-2 was relatively easy. We had the
2 “meillerwagen”. And we would transport it horizontally on the meillerwagen, you
3 could go cross country, you were not limited to the roads. Then the folks waiting
4 at the launch site eventually erected it, put it on the launch table. Now I do not
5 know how it was with the upper stage and I don’t know if you know. If that was
6 already attached to it during the transport it is possible that it was
7
8

9
10 Gray: Attached to the launch table?

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12 Dannenberg: No, the upper stage.
13

14
15 Gray: Oh no, the WAC was not attached. The V-2 was laid down then the WAC
16 rolled up in there real slow.
17

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19 Dannenberg: And that was done here? At the Cape?
20

21 Jones: Yes
22

23
24 Dannenberg: And probably also in White Sands in the same way. But the actual
25 operation, the V-2 was really designed for flexibility so you could easily handle it,

1 erect it and do all the things. Of course you needed the transport vehicle. You had
2 to get the main propellants in, and also hydrogen peroxide to drive the turbo pump.
3 This material should not get too hot here, otherwise it might explode already in the
4 storage tank. So you had to be careful with a number of things. But soldiers were
5 pretty well trained and they knew it. And the Redstone was practically the same
6 system and many of the people who launched initially V-2s launched later on
7 Redstones.
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11 Jones: Didn't we also use sodium permanganate in that?
12

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14 Dannenberg: Yeah, but not for the Redstone, for the V-2. The Redstone used the
15 silver screen; of course, during the war we had no silver in Germany.
16

17
18 Bain: Those of us that didn't know what was going on as far as that's concerned,
19 figured it was put together with masking tape and chewing gum! (laughter)
20

21 Bank: A lot of blood, sweat and tears.
22

23
24 Launius: Yes, indeed.
25

1 Gray: One of our big problems with the WAC, was the propellants that it used. It
2 used the red fuming nitric acid.

3
4
5 Dannenberg: No, no.

6
7 Gray: Yes. The WAC.

8
9
10 Dannenberg: For the upper stage, yes.

11
12 Gray: The WAC. Upper stage. Red fuming nitric acid with aniline and these two
13 fuels didn't like each other. It was a good fuel exactly for the propulsion system.
14 You got them together one drop at a time you had to terrific explosion. So, that's
15 what you call a hypergolic reaction.

16
17
18
19 Unknown: Right.

20
21 Launius: We need to bring this to a conclusion. I'd like to thank you all for
22 coming. We want to interview each of you individually. We're going to try to
23 schedule those. I think some we have already scheduled and others we'd like to try
24 and schedule for the future. But thank you so much for spending an hour or so
25

1 with us today. I apologize for the heat of the room. I hope you found it
2 interesting. And I want to thank you very much.
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