

**Mr. John Straiton's
Oral History
Kennedy Space Center
Held on June 19, 2001**

**Interviewers: Dr. Henry Dethloff,
Dr. Lee Snaples**

*Straiton's
collection*

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1 Henry Dethloff: Today is May...

2

3 Lee Snaples: June...

4

5 Dethloff: June the 19th 2001 and we're in Kennedy Space Center OSB 6121M, it's
6 hard to find. And Lee Snaples is here and I'm Henry Dethloff and we're about to have
7 an oral history interview with John Straiton. And John if you would, we'd like to start
8 these with if you would state your full name and maybe your place of birth, time of birth.
9 And tell us a bit about your early years and background and how you got into NASA in
10 the first place. I think would be a good start.

11

12 John Straiton: OK. My name is John Artie Straiton and I was born in Auburn,
13 Alabama, back in 1945 and actually grew up there. Went to the Junior High and High
14 School and on to college there. And graduated in 1968 with a degree in Electrical
15 Engineering. And at the time I remember it was the middle of the Vietnam War and
16 most people were looking at either going off into technical positions where you could
17 stay here versus getting into the Army or Air Force or any kind of military service. And
18 at the time there was very hot aerospace competitiveness as far as the race to the
19 moon and the commitment that NASA had publicly and it really kind of infatuated me
20 with the possibility of going to work for NASA. Coincidentally, I had a cousin that was
21 here at the time and he more or less convinced me that this would be a real good career
22 to go off into.

23

1 Dethloff: He was actually here at KSC?

2

3 Straiton: Right. He was here for a period of time. So I came down for an interview
4 and I liked it and decided among a half dozen or so offers that this was the one that I
5 wanted to go do.

6

7 Dethloff: And that was in '68?

8

9 Straiton: In '68.

10

11 Dethloff: Right after you graduated.

12

13 Straiton: I came here in June of '68 right out of college. And quite frankly this is
14 where I've worked my entire career and don't really until right now have experiences on
15 the Contractor's side so. But...

16

17 Dethloff: What was your first assignment when you hit KSC and who did you work
18 for?

19

20 Straiton: I came in here as a Telemetry Systems Engineer for the Saturn vehicle,
21 the S-IC Stage and the instrument unit stages. And we were responsible for writing the
22 procedures and performing the testing, pre-launch testing, and supporting the actual
23 launches of those. So I was a very impressionable young engineer back then and the

1 first time I came in here and saw the size of the VAB, which I'm sure anybody that
2 shows up here, it was, it just was awe-striking to me. And so I was pretty infatuated
3 with the whole thing and it was the height of the Program and there were probably
4 25,000 people out here collectively working. And there were some days you came to
5 work and it might take an hour and a half and you were always looking for a place to
6 park. There was a major commitment to getting the man on the moon program
7 accomplished before the end of the decade. And fortunately we were able to do that.
8 So that's where I started out...

9

10 Dethloff: You got thrown right in to that.

11

12 Straiton: Right. So...

13

14 Dethloff: You were doing lunar...

15

16 Straiton: Right. I came in, Apollo 7 I think was the first vehicle; Apollo 6 or Apollo 7.

17 And then we were launching Saturn V rockets with the Apollo crews. And so I worked

18 all of those missions and after we landed the first two or three on the moon I was

19 looking maybe to consider doing something else. There were a number of us at the

20 time that were looking for advanced degrees out of, at the time it was, well Florida

21 Institute of Technology down in Melbourne, and so we...

22

1 Dethloff: Incidentally, about the time you arrived there already was sort of a down-
2 turn in employment contractors; that kind of thing and budgeting.

3

4 Straiton: Exactly. I mean...

5

6 Dethloff: Did you know that or did...

7

8 Straiton: Right.

9

10 Dethloff: ...feel that when you got here?

11

12 Straiton: That was the one time as a very young engineer I was a little bit
13 concerned about Reduction In Force even within NASA. But as soon as we landed the
14 first mission on the moon the Contractor workforce started trailing off fairly significant.
15 And guys I was working with that were enjoying a lot of overtime and big paychecks. I
16 was just the NASA guy putting in the basic time and came in; it was not the top salary
17 offer that I had had so. After the first year or two of the first man on the moon, many of
18 those guys that I started out working with on the Contractors side were gone. So it
19 definitely tapered off fairly fast and in the mid-70's when we did the Apollo-Soyuz Test
20 Project was about the time I was looking at doing something different. As I was
21 mentioning a number of us went back for advanced degrees and got one in a Master of
22 Science in Digital Computer Design. And at the time I wanted to consider applying it
23 and there was a new project just starting out. Shuttle was getting a fair amount of

1 concept definition in the very early 70's. And the first thought locally here was the
2 infrastructure and what did we have to do to get it ready. And one of the big major
3 pieces of that was the processing system to go do the Shuttle checkout and launch. So
4 it was the latest state-of-the-art technology with a hand-picked group of guys that were
5 under Tom Walton's guidance that were sequestered over in the old Flight Crew
6 Training Building. This is in the, probably around '71 or '72 time period. And I went
7 over in about that '72 period and got in on the ground floor part of that doing hardware
8 design. And then moved into software interface testing and design. So that was where
9 I spent my early '70's.

10

11 Dethloff: Who are you working, are you working with Shuttle Contractors primarily
12 in...

13

14 Straiton: This was under the...

15

16 Dethloff: Are you doing launch design?

17

18 Straiton: ...at the time we were designing the launch and checkout system to be
19 used by the Shuttle Organization out here to do that. And so we were under the
20 auspices of Design Engineering Directorate here at Kennedy.

21

22 Dethloff: Who was that? Who was Head of Design Engineering?

23

1 Straiton: The guy I worked for directly was Walt Murphy who had the software
2 group over there. And that was under Henry Paul and Ray Clark as I remember.

3

4 Dethloff: So you're really in on the ground floor of the Shuttle development.

5

6 Straiton: Right. Yeah. One of the primary things I did in my responsibilities was the
7 interface design to the flight vehicle. So we were having to go support the early Shuttle
8 design concepts and try to influence those as much as we can. And one of the things I
9 helped with was the early onboard checkout software that the ground systems used.
10 And so we had to make sure they were compatible and that the interfaces would match
11 up. And I did that for about 4 or 5 years and we delivered the...

12

13 Dethloff: So you're starting that about '72?

14

15 Straiton: Yeah.

16

17 Dethloff: All right.

18

19 Straiton: Going to '77.

20

21 Dethloff: OK.

22

1 Straiton: So we got there through the original design and delivered the initial
2 hardware sets to the operations organizations out here who are the people that were
3 actually doing the checkout and launch. And we had done all the testing and then
4 delivered it. And the first thing I did was, since I came from that organization, there was
5 a group and Tom Walton was one of the first ones to make the move to the operations
6 side of the organization. So many of the guys that were on the ground floor developing
7 it and most familiar with the design and what its capabilities were, were guys that went
8 over to the operations organization after it was developed and delivered and became
9 the users of it based on that familiarity. There's a facility out in Houston that had all of
10 the high fidelity avionics integration called the "SAIL" Facility that we took the initial sets
11 out there and did a lot of the vehicle interface testing with them. There wasn't anything
12 locally here. The Columbia vehicle was still being assembled and tested out at
13 Palmdale and it didn't get here until 70-something.

14
15 Dethloff: Did you stay on the road a lot during that period? I mean between here
16 and JSC.

17
18 Straiton: I spent most of '77 and '78 working at JSC doing that initial design. And
19 on the Operations side we were just starting to develop all of the, what we refer to as
20 the applications software and the procedures for doing the series of tests on the vehicle
21 here. So one of the big benefits that we got out of that facility out there was we dry ran
22 everything. We found out where the problems were with the vehicle interfaces. We got
23 a lot of stuff fixed in that facility out there before we ever saw it on the vehicle for the

1 first time here and we proved all our procedures. And there were an extensive number
2 of tests, as you can imagine, for the first time Columbia went through here. We were
3 under the tile umbrella at the time so there was enough software problems that needed
4 to be fixed. We took advantage of the time to go sort them out before we ever powered
5 Columbia up for the first time. So by the time we did that it was a fairly clean set of
6 procedures and the people that did it had been through; we took every major procedure
7 through the facility out there with a subset of the test team to basically go exercise it.
8 And there was something at the time called Dynamic Integrated Test, DIT, which was a
9 captive sim-flight of the vehicle; that when it was sitting here in the OPF and went
10 through the VAB and on to the Pad that in that mated configuration. We basically fooled
11 the vehicle in to thinking it was flying by supplying it with data from the ground that
12 would normally be coming from the onboard sensors that made the flight computers
13 believe that they were actually flying. So the flight displays were up and we would go
14 do all the terminal count and then fly an ascent and we did the same sort of thing on
15 these, on the entry. So John Young and Bob Crippen got a lot of testing on the real
16 flight software in the real flight vehicle with the real procedures that we used for
17 checkout. It was their real procedures. And the testing that would actually be doing it. I
18 think that was one of the significant things that bought us a lot of confidence leading up
19 to STS-1.

20

21 Dethloff: Well that's interesting. So they're really getting flight time...

22

1 Straiton: And they had spent time going through the same DIT dry runs at this
2 “SAIL” Facility and they were in the flight simulators out there. So wherever they went
3 that the vehicle was simulated into flight, either ascent or entry, they saw the same sort
4 of indicators and results and expectations. And we did have quite a few software
5 problems in those early days.

6

7 Dethloff: I was going to ask you that. Was there anything particularly, I won't say
8 dramatic, but particularly problematic that kind of threw everybody?

9

10 Straiton: I don't remember any significant thing. It was the challenge of, make it as
11 with every project and program, the initial set of requirements; condensing them to
12 where you can generate code that you actually fit in the flight processors and still keep
13 everybody reasonably happy that you've accommodated what their needs are. And
14 cause the computers, the original computers I believe were 64K machines, which there
15 was five of them, and in fact the main engine computers that we started out with were I
16 believe 16K machines. So we're talking...

17

18 Dethloff: Apples?

19

20 Straiton: ...you know mid-70's technology. Early in mid-70's technology with this
21 vehicle.

22

1 Snaples: Just out of curiosity, do you happen to remember how many lines of code
2 you were talking about? Just ballpark.

3

4 Straiton: Um. The flight system was I would think in the low millions of source lines
5 of code and the ground checkout software we had was probably at least 2 or 3 million
6 lines of code. Of course it didn't all reside in the flight computers at the same time.
7 There were mass memory storage devices that it was rolled in and out of. It all
8 basically, they had these Op's phases depending on whether you were in pre-launch
9 checkout or in what you call G1 ascent and then once you got through various about 9
10 modes going to orbit you would transition to an on-orbit.

11

12 Snaples: What did they use as storage? I mean, hard drives?

13

14 Straiton: The mass memory was a big magnetic tape. I think it's solid state
15 memory today. I'm just now coming back to the Shuttle environment after about a 20-
16 something year absence. Because the years leading up to STS-1 were probably the
17 most challenging for a lot of NASA people on the Shuttle side. Because NASA was
18 basically leading the effort and we had Rockwell and Martin back then that were
19 engaged with us. But systems engineers were taking the requirements and helping
20 define them. And then go and writing procedures and writing software and then sitting
21 on stations. So they were responsible from end to end. Today it's a little bit different in
22 that we've got a tremendous amount of run time on all of that flight software and ground
23 software that, you can imagine any good engineer is going to resist changing things.

1 And if somebody wants to suggest changing something to them, they want it as
2 transparent as possible. So there's, some of that stuff has been around in the same
3 form for the last 20-something years 'cause having been through STS-1 through 5 here
4 and then I went to Vandenberg to help them with their first Shuttle launch out there.
5 And then spent the better part of 4 years out there. Came back and worked Space
6 Station. And it has only been in the last 6 or 8 months that I am now back into the
7 Shuttle Program. And a lot of the displays in the Firing Room and the processes used
8 for launching it, the procedures are the same as what they were 20 to 25 years ago.
9 And that's a testament to the confidence people have in those things. There's a
10 program underway now to look at upgrading a number of those systems and that's
11 basically the project that I'm on now with, you can imagine a computer system built in
12 the early '70's with that technology that is on its shaky last legs now. And we've been
13 able to maintain it through just as many additional spares of the hardware and few
14 software changes that it's time to... you know, as a part of adding more safety and
15 upgrading the flight systems we want to go to a newer technology on the ground
16 systems as well. So we're going through a major rewrite of all this applications
17 software. And it's caused a fair amount of uneasiness in the system engineering arena.
18 And they would just as soon, like I said, keep things transparent. But we'll get there
19 over the next 3 or 4 years it'll be a phased implementation and we'll slowly give them
20 the confidence that the stuff will work.

21

1 Dethloff: I'm going to ask you more about that in a few minutes. So you're in this
2 from '77 to '78 and STS-1 in coming out in '82. Are you deeply involved in Shuttle
3 activity right up the firing?
4

5 Straiton: Right.
6

7 Dethloff: OK.
8

9 Straiton: Right.
10

11 Dethloff: To the first launch.
12

13 Straiton: I mean we, I can't remember we had a half dozen of these major tests that
14 we probably ran at least a half dozen times before we got through them cleanly. We
15 had a lot of different problems. At the time I was working the avionics and software
16 interfaces to the flight vehicle and supporting some of the ground launch sequencer
17 activity from the integration console and sat on the integration console for the first five
18 launches out here. So you get a fair amount of insight into that being the focal point for
19 what's going on in terms of the testing and where the problems are. So I thought,
20 everybody's got their major project that they need to go through in their career and that
21 was probably mine and a number of other people. And it takes its toll on you physically
22 and the hours and... But you look back on it with great satisfaction that you were a part
23 of that.

1

2 Snaples: Were you out here for the test when the two guys were killed in testing for
3 STS-1?

4

5 Straiton: Yes. I remember. That was the Flight Readiness Firing or a procedure
6 leading up to it and yeah, that was one of the bad moments that we had. But we
7 managed to learn from it and go on and successfully get through it.

8

9 Dethloff: Let's talk about STS-1. Bringing it in. Getting it ready for launch. That
10 probably was a high point.

11

12 Straiton: I remember the day that it arrived. There was a ceremony out on the
13 runway there and the thing flew in and it looked sort of like a patchwork quilt with about
14 half the tile missing and there was a lot of work that was moved from Palmdale. And
15 the first or actually next couple of years or so the emphasis was on finishing putting
16 those tiles on the vehicle and keeping them on the vehicle. And being in the software
17 and procedure area we were kind of under their umbrella because that was the critical
18 path and the tent pole for the program. And we had just as a serious amount of work
19 that we had to go complete and that afforded us time to go do it.

20

21 Dethloff: That's an interesting insight. I never heard that before.

22

23 Snaples: So if it hadn't been for them, you might have been the hold up.

1

2 Straiton: Well we definitely would have if that thing had of come in here assembled
3 and tile all on it and everybody felt confident because that was state-of-the-art stuff and
4 there was still a lot of unknowns with it.

5

6 Dethloff: You know one thing we've been picking up from anybody we talk to
7 basically, is that when the vehicles get here for launch they're not ready. No matter
8 what it is. And that the job of KSC has been heavily to get it ready.

9

10 Straiton: Right.

11

12 Dethloff: And to make it fly. Does that pretty much fit your experience?

13

14 Straiton: Yeah. On the Shuttle side that's true. And the Space Station side, which I
15 guess we'll get into here in a little bit. That was certainly the case. Now I was at one
16 point in the Payloads Organization where they have external customers that have their
17 own facilities and are most familiar with their payloads. And to a large degree many of
18 those come in here pretty, completely tested and some final interface checks get done
19 here and the thing is put in the Orbiter. But the rule certainly when it comes to Shuttle is
20 to get the vehicle to the launch site. You get a lot higher visibility and attention to
21 schedule and the drivers and certainly the safety aspects of it by certified people that
22 have basically taken over the final assembly in a lot of those areas. They send them to
23 Palmdale for minor mods and seems like if you don't draw the line somewhere and

1 package the thing up and send it with open work then you'll never get it delivered. And
2 so the schedule was a concern and Kennedy had the ability and the infrastructure and
3 frankly a number of the people came from California that most of the tile people came
4 from California.

5

6 Snaples: Anything else you want to ask on STS-1?

7

8 Dethloff: No. How about just describe the lift-off as you remember.

9

10 Straiton: Well I...

11

12 Dethloff: Or are you looking at the panels more than...

13

14 Straiton: No. I mean, I was sweating bullets up to that point like a lot of other
15 people that, it was just an unknown to us. We had a lot of confidence in what we had
16 done up to that point but I don't think any of us were quite totally sure of what you know
17 that that thing, 'cause we had never seen it before in flight. Seen animations of it. But
18 there was a great deal of satisfaction in seeing that thing get to orbit. And I think it goes
19 without saying that there were a lot of guys holding their breath for 8½ minutes until
20 those engines cut off and the thing was up there.

21

22 Snaples: Was there maybe any sense of kinship with the people who had launched
23 the earlier rockets who had been in the same boat you were? That they had no idea of

1 what was going to happen. Well I mean you have your thoughts but you're always
2 worried.

3

4 Straiton: You mean people on other previous programs that...

5

6 Snaples: Right. Because you had come in once Apollo was up and running and so
7 it would seem to me this is the first time you've ever had to go through building a
8 program from scratch and maybe you're feeling the same things they were when the
9 first Apollo launched.

10

11 Straiton: I'm sure I was, as most everybody else was. You get so engrossed in 
12 what you're doing that you're focused on your specific area and making sure it's as
13 absolute ready as it could possibly be. That it doesn't hit you of the sheer magnitude of
14 the entire thing together and the complexity of what you're a part of until you see that
15 thing light and lift-off.

16

17 Snaples: Yeah.

18

19 Straiton: And it was like, I know a lot of the astronauts had, the early ones that went
20 to the moon, they had spent years training for that, had mental let downs after...

21

22 Dethloff: After it was done.

23

1 Straiton: ...they got back. And what's the next challenge in my career. And I had
2 frankly a little bit of a let down after STS-1 because that was a lot of years work leading
3 up to that and it was very successful and now what do you go to? Well I mean we went
4 and did the next one. And then after 3 or 4 more it was starting to me to feel a little bit
5 more repetitive. And there was the opportunity that the Air Force was getting interested
6 in launching one from Vandenberg and they solicited help from KSC based on us
7 having done 4 or 5 of them here to help them with their first one. So it was a good
8 opportunity to go get in the middle of something.

9

10 Dethloff: So you... OK... you took the opportunity. Yeah.

11

12 Straiton: So it was offered to me and I took it. And there were probably 10 or 12 of
13 us at the time that went out there and did the initial site activation and that was in '80,
14 late '82 early '83. And we were progressing toward first launch out there in '86. In fact,
15 January of '86 we were within 6 months of our projected launch date, which was mid-
16 July at the time, when Challenger occurred. And we knew that there was going to be
17 significant downtime just for the Program to determine the cause and go fix what had to
18 be fixed that we didn't see any point at Vandenberg with... we hadn't been past the first
19 one so it was going to be a very extended down period there. So we basically came
20 back here. I decided personally at the time that I wanted to go do something different
21 after 4 years invested out there trying to get ready. So I used it as an opportunity to go
22 into the Payloads Organization and the first thing I did was get in the middle of Space

1 Station design. And I'm talking 1986. That's how long Space Station's been around on
2 the drawing boards.

3
4 Dethloff: Let's come back to that in just a minute. There are some very broad
5 questions or issues I'd like to raise. One is that here at KSC did you sense much
6 transition in management style, character, atmosphere, whatever you want to call it,
7 after Debus left in '74 or '75? Scherer comes in early '75. Was there much change in
8 the climate, the work climate, the attitude, the engineering environment I guess that's...

9
10 Straiton: Well...

11
12 Dethloff: And then I want to go from there to Vandenberg. Was there much change
13 in the NASA versus the Air Force?

14
15 Straiton: When I, and granted this has been 30 years ago I'm trying to remember
16 some of this. But coming in, in my early twenties and at the time I did in the middle of
17 the Apollo-Saturn Program, which Dr. Debus was Center Director and the hierarchy
18 here was a lot of Germans that were in the key positions. And it, the thing I remember
19 about it is there was definitely a hierarchy in the Organizations. And I was in a
20 particular section at the time for the Telemetry and Instrumentation that you basically
21 worked your problems there and if you needed, at times you would have to go brief
22 others above you. Be it Branch or Division or even above that. And it was a very formal
23 process you went through and everything was very business like. I remember the suits,

1 I mean the ties and coats and the order of the day was more formal and structured as
2 you can imagine that being. And what I remembered after we actually got over in to
3 doing the early Shuttle, it was and Lee Scherer became the Center Director, that things
4 were a lot more relaxed. We weren't flying vehicles. We were building them. And it
5 was more the casual shirts and no ties. And that environment I worked in over in the
6 Flight Crew Training Building for five or six years was very informal and relaxed. And
7 not on any, I mean you could go in and talk to anybody you wanted to at any time and
8 there was much less hierarchy with it.

9

10 Dethloff: Good. OK.

11

12 Snaples: Did you ever notice any sort of resentment against the German hierarchy?
13 The idea that here are these in effect foreign nationals. You know people who had
14 been part of the war effort against us who are running our Space Program.

15

16 Straiton: I probably was too young to have any of those kind of impressions.
17 Because most of the guys I was working around were Americans working for them and
18 they interfaced with them. I never had really the opportunity and the few times that I
19 did, I didn't think about that aspect of it. It was just someone that maybe had a different
20 accent than I did and that was about the extent of it.

21

22 Dethloff: Yeah. We haven't seen much sign of it. We were just curious you know
23 that there was that.

1

2 Straiton: No.

3

4 Dethloff: Then when you leave here and go to Vandenberg, how about the climate,
5 the work . . .

6

7 Straiton: That was an experience that I probably had totally misread to begin with
8 that a... because we were... the arrangement NASA had at the time was that NASA
9 would eventually put enough people out there for the early planning to make sure all of
10 the infrastructure and everything was in place to go launch the first one from there. And
11 in fact, NASA would be responsible for the first Vandenberg launch. And by the time we
12 got to that point... and then the second launch from there we were looking over the
13 shoulders of the Air Force guys. They basically were reporting to us. We were
14 imbedded within their organization. We had our own separate organization. But in
15 terms of making the recommendations to them in terms of what needs to get done to
16 get this thing ready to be processed and getting it to that point and signing the thing off
17 as being certified to launch vehicles, NASA was doing that with the Air Force. And by
18 the third launch we were basically out of there and they were fully in charge and
19 responsible for it. So we only had a handful of probably a dozen initially and then within
20 a year or two there were about 35 or 40 more added. We at the time the program was
21 basically put on hold we were probably 40 or 50 strong out there and the Air Force guys
22 were in essence reporting to us. We, in a lot of cases, had to become familiar with the
23 military processes. We were still in the Cold War at the time I remember. And we, the

1 early ones of us out there were privileged to be involved in some of the secret briefings
2 on the status on the Russian Shuttle Program at the time and where that was. And that
3 I thought was one of the most intriguing parts and to have an opportunity to see it from
4 the inside I thought was pretty special. And it was a little different environment out there
5 besides the people. We did the checkout of the vehicle from north-base and then we
6 moved it down to south-base and had a Launch Control Center out there at what was
7 known as Space Launch Complex 6, SLC-6, that the Control Room set just a few
8 hundred feet from the base of the launcher. And it was reinforced at the base with
9 about 12 feet of concrete tapered back and the people that did the final checkout and
10 launch sat that close to the vehicle. And at the same time I remember we were laying
11 out the Firing Room consoles with the displays. And the initial layout had them pointed
12 toward the ocean and there was enough concern with the Russian trawlers out there
13 picking up information off of these displays. It's hard for me to imagine how that could
14 happen, but they assured us it was possible, that we turned the consoles around. And
15 the payload rooms that were shielded with all kinds of metals and leads and it was just
16 kind of a very secret environment we were operating in that...

17

18 Snaples: Did they build a full crawler way and VAB and everything?

19

20 Straiton: The vehicle got assembled on the Pad out there.

21

22 Snaples: OK. So they went back to that.

23

1 Straiton: Yeah. In fact, Enterprise was brought out there as a pathfinder and just to
2 test the facility and Pad interfaces. But you assemble the SRB's on the Pad, on the
3 launcher, and brought the Orbiter out there and mated it. As kind of an afterthought
4 because of the winds and the weather they built a Shuttle Assembly Building. It was
5 late in the activities out there as almost an afterthought to enclose the whole structure.
6 And then there was a Payload Processing Facility that was to me one of the first class
7 facilities for processing payloads. There was just about anything in it that you wanted
8 that would roll up and you could deliver the payload into the Orbiter from there. But all
9 of that, it was never on a crawler or transported to the Pad, it was built on the Pad.

10

11 Snaples: OK.

12

13 Dethloff: So you leave there in '86. Come back to Payloads and you're in
14 Payloads.

15

16 Straiton: Right.

17

18 Dethloff: And it was Payloads that really got you into the Shuttle?

19

20 Snaples: No. ISS.

21

22 Dethloff: I mean in...

23

1 Straiton: Space Station.

2

3 Dethloff: ...Space Station.

4

5 Straiton: Right.

6

7 Dethloff: Could you tell us a little bit about that return now and your Payloads work
8 and the development of the Space Station as you see it from the KSC prospective.

9

10 Straiton: Well when I got involved in '86, Space Station had really been going on on
11 the drawing board for several years and some of the guys here were actually involved in
12 it at the time. And it was going through initial concepts and defining and documenting
13 the requirements. And that was in Washington DC which is where the Headquarters
14 were. And there was a small Project Office here at Kennedy and so we were making
15 regular trips to Washington to support that because all of the Program Systems
16 Engineering and Integration type guys were actually located there as well. It was
17 centralized in Washington. So we did a lot of early concepting and designs and flows
18 for the launch site here as to what we would do and it was basically a ship and shoot
19 mentality at the time. And I think a lot of that had to do with trying to hold down costs.
20 And when you're early on in any project testing always takes a back seat to selling the
21 programs and so you don't have a heavy load of costs in there for doing that sort of stuff
22 knowing it'll have to get picked up at the end. That's exactly what happened to Space
23 Station here before it was over with. They put the realism in it for the launch site. But

1 we had proposals for doing multi-element integrated testing. We called it MLPI, Multi-
2 Launch Package Integration, going back to the mid-80's of putting multiple elements
3 from the...

4

5 Dethloff: Say that again, would you please? Multi-...

6

7 Straiton: Multi-Launch Package Integration was the original acronym for that. That
8 we put this stuff together on the ground here in a 1G environment and did the interface
9 testing to find the problems here. And we struggled as everybody remembers with the
10 cost control out of the '80's into the '90's. We were at the time '91 or '92 breaking
11 ground on the Processing Facility over there. So Kennedy was starting to put the real
12 infrastructure in. We weren't quite sure what this thing was going to look like or what we
13 were going do with it, but we were going to build a big building that had enough
14 flexibility in it that we could operationally do about anything that was required. And
15 surprisingly enough based on where the Station design was in the plans for processing
16 that thing, we anticipated pretty completely what it would take to get the hardware
17 through there. We've... with the Russian delays that occurred later there was starting
18 to be a backlog of equipment stacked up in that facility over there that some of it spilled
19 over into the Operations and Checkout, the O&C Building that it was... we had a
20 number of truss elements over there. So we had Space Station flight hardware sitting at
21 Kennedy for...

22

23 Snaples: A while.

1

2 Straiton: ...a while. And a lot of that in '93 was when the big initiative as I
3 remember it from Mr. Goldin to go redesign Space Station. It costs too much. It was
4 too elaborate. And it costs too much to maintain and certainly operate on orbit. So
5 there was a group put together that was secluded in Crystal City, Virginia, in '93 that
6 basically went through this design. And the original program named from the mid-80's
7 until that point was Space Station Freedom. And they were out at the time in Reston,
8 Virginia. They were frantically trying to come up with their own cost savings ideas and
9 re-architecting the thing. The original design for the thing you would look at now 15
10 years later and not even fathom how you would even consider that. It was a concept
11 built on what's called sticks and balls. The truss structures had very elaborate, literally,
12 balls and struts that the astronaut had to assemble this stuff piece by piece on orbit.
13 And to me one of the biggest re-design concepts that came out of all that was the idea
14 of instead of trying to assemble the truss part on orbit, let's put it together on the
15 ground. And...

16

17 Snaples: Ship it out.

18

19 Straiton: ...so they came up with the idea of these pre-integrated trusses where you
20 basically had the whole thing assembled here on the ground. You outfitted it with the
21 power, data, and electrical type interfaces and so all you had to do... and you checked
22 it out on the ground. So when you got it on orbit all you basically had to do was hook
23 the major elements together and their associated interfaces which is what we basically

1 did in this multi-element integrated test. We hooked those interfaces together to verify
2 they'd work on orbit. We didn't want to do anything for the first time on orbit. And the
3 previous Freedom design had a lot of that kind of stuff and the overhead that goes with
4 it so.

5
6 Dethloff: When did the International presence begin to become large in the Space
7 Station?

8
9 Straiton: I think it was always there from the beginning. But it, I believe, was in the
10 re-design period of the early '90's when we realized we couldn't bear the burden of the
11 total cost. The American taxpayer wasn't going to pay for it and at the same time it was
12 a good opportunity to bring the International level of participation up. So there were a
13 lot of trades as I remember as a part of that in return for your help to build a node or a
14 lab you get additional on-orbit time or...

15
16 Dethloff: Did you have any direct contact with the Russian counterparts or any of
17 that?

18
19 Straiton: I didn't personally. There was a group out of NASA Headquarters that did
20 that. And after the design was approved they moved the Program Office function and
21 management of that to the Johnson Space Center. And so by '94 or '95 after the design
22 was all approved and the funding for it, and there was a cap associated with that. We
23 primarily dealt with the people at JSC. And the Russian aspect of it, if you think about it

1 from a Kennedy perspective we didn't really have any of that hardware coming. There
2 was some minimal pieces that came through here. But the Russians were building and
3 launching their own stuff on their own vehicles...

4

5 Dethloff: Yeah.

6

7 Straiton: ...and doing their own checkout over there. It wasn't until later that some
8 of the early docking adapters and the Mir docking adapter as a part of that collaboration
9 with them, there were 8 or 9 Shuttle flights to Mir that we had to have a docking
10 interface there. But the US ISS, International Space Station, was for the most part the
11 US developed elements and the international partner elements came later in that
12 assembly sequence. And as a fall out we were dealing with some technical problems
13 with propulsion and altitude control. That the Russians were in that early partnership in
14 redesign was really a way of selling the program and salvaging the program and that's
15 getting into the politics of how we ended up with the Russians. But they have a much
16 more basic approach to vehicles and they've been doing it a lot longer. And I didn't deal
17 with them directly, but I certainly heard a lot of the US guys who haven't got a Space
18 Station on orbit and the Russians did and had since the mid-80's you gotta be careful
19 how you go in and suggest things to them. Because they've got a very proven track
20 record and their vehicles work and they deliver stuff. It may not always be pretty. It
21 may not always be the latest technology but it works.

22

23 Dethloff: Yeah.

1
2 Straiton: But my involvement by that time, we were in '96, '97 time frame and we X
3 were within about a year of delivering the first US element, the node, to KSC. And there
4 were some organizational changes made here to accommodate that. To that point all of
5 the KSC Space Station involvement was over in the Payloads Organization in terms of
6 the detailed planning and implementation to support it. And with the focus on the
7 hardware now shifting to the launch site, the Hardware Integration Office was
8 established that really was a Program function under the, it was a delegated set of
9 authority from the JSC Program Office that Tip Talone headed up. Then by that time
10 before the hardware started showing up here we had a Payloads Organization that
11 became the implementers of the requirements and the owners of those requirements
12 and the program representation was this Hardware Integration Office. So we had two
13 different Directorates here at the time to go manage that. And George Abbey had, this
14 is where he had a very significant positive influence in terms of, to that point the
15 developers of the individual elements were wanting to do all their factory testing. They'd
16 build the simulators. They would deliver the stuff to the launch site ship and shoot. And
17 George just knew that wasn't going to happen. And so he started a push to get the
18 flight hardware to Kennedy and get the developers and the designers down here
19 involved in it. And let's adopt kind of a build a little, test a little approach and you're in
20 the Kennedy environment and under Kennedy auspices here. We were supporting a lot
21 of that originally. And again the costs were significant, but George wanted the realism
22 of we've got to test this hardware at the launch site. You can't depend on testing it
23 somewhere else, shipping it cross-country, doing some cursory check on it and

1 expecting to launch it. And oh by way you can't expect to be hooking all of these
2 interfaces from these different missions on orbit for the first time and not expect to have
3 problems. So the concept even though this multi-launch package integration idea had
4 been around, it never came to fruition until the Program got serious about the hardware
5 showing up here and what really needed to be done. And in fact we pointed out where
6 there were some deficiencies in the developer's plans for doing that testing. That it was
7 basically edicted that we needed to go plan on doing not only more testing of the
8 individual elements at the launch site, but we need to look at a way of affording to test
9 the multiple element interfaces from the different flights here at Kennedy. And that's the
10 concept of MEIT.

11
12 Dethloff: And that was formed. Then you actually created the MEIT organization
13 when?

14
15 Straiton: That was in the I'd say '97, '98 time frame. It was just about the time
16 hardware was showing up here a year or so before actually. Even though the concept
17 had been around, it was taken a lot more seriously. And that was about the time that
18 we were starting to see some of the Russian delays and we were having trouble with
19 our hardware. It was falling behind schedule. So it created an opportunity to go do this.
20 Now you had to figure out a way of doing it where you could afford it. And one of the
21 ways to do that is let NASA be responsible for it. We couldn't afford to pay Boeing who
22 was the prime contractor at the time to go do this. And frankly it was a good way of
23 Kennedy taking a more direct role with that activity and the visibility that comes with it

1 and feeling involved with it. So we went after it and we basically put a proposal together
2 that defined all of the requirements and what missions we were putting together, on
3 what kind of schedule. And the developers of all that hardware never disagreed that it
4 was a smart thing to go do, you just figure out how do you go pay for it. And so we at
5 the time we did it and now we're into late '97 early '98 with trying to do some of the
6 initial testing. We...

7

8 Dethloff: Excuse me. Who's taking the leadership in that? Is it Bridges or Crippen?
9 Who is, I'm lost.

10

11 Straiton: Roy Bridges was the Center Director.

12

13 Dethloff: Yeah. OK. All right.

14

15 Straiton: And we obviously had to go sell Roy on the idea that we could take this on
16 and do it. And there were a lot of formidable challenges with that. And so the way that
17 the organization was set up under Roy was as I mentioned earlier, Tip Talone's
18 Hardware Integration Organization had the requirements for MEIT and they did the big
19 schedule for the thing. Now at the time it was Steve Francois, actually Bobby Bruckner
20 and then Steve Francois, heading up the Payloads Organization. We became the
21 implementers of all those requirements. Our people had to go build the procedures and
22 actually do the testing. And we had support from the contractors because they were the
23 experts on the hardware. So we put that whole picture together and we had as I

1 remember four basic test configurations. We did this stuff somewhat incrementally
2 because you just can't lash it altogether and power it up and expect to test it. So we did
3 it a block at a time, one mission added to the next mission then we added the next
4 missions after that and then the final missions. And we had probably more
5 configurations initially that after we got into it and saw slicker ways of doing the testing
6 we cut one or two of those out. One of them I remember was associated with the mini
7 PLM interfaces making sure that the International Partner command and data and other
8 interfaces all functioned. We found a way of doing that off-line with all the confidence
9 that it would work on orbit. We put together the node by this time had already been
10 launched and was on orbit. And so we basically built a rather crude simulator for it. It
11 was more a functional simulation. There were a couple of what's called multiplexer
12 demultiplexer boxes on that article that we got flight equivalent units and we hooked
13 them up to at the time it was the Z1 and the P6 truss. And that became a particular test
14 configuration. And we incrementally added the elements from the missions until the big
15 one that we added was the lab, laboratory from the 5A mission. That became, I
16 believed we called that TC2. The first early elements was TC1 and then we added the
17 lab and that became TC2. The one that fell by the wayside was TC3. That was as I
18 remember the mini-PLM one. But the last big one we had was TC4 and that was the
19 Canadian Arm interfaces because it was a critical path for us. It had a lot of interfaces
20 that, you have enough difficulty dealing in the United States with different developers of
21 hardware. But when you now introduce the international aspect of it and the likelihood
22 of misinterpretation degrees of philosophy about testing and how you go about it that we
23 really needed to make sure that that worked right. So they had done a lot of testing in

1 Canada and we supported that. We sent people up there. Got involved in it. We had
2 the equivalent to this "SAIL" lab or facility in Houston at JSC that we took our guys out
3 to. And it was a reasonably high fidelity functional, the name of it escapes me for the
4 moment, and we dry ran our procedures. A lot of the same philosophy we had for the
5 Shuttle as far as getting everything ready and then we started hooking it up here. Now
6 the first time we went through all of this stuff we had a lot of problems. The software
7 was not mature to begin with. We actually had one hardware problem with an interface
8 box that was, it was a power control box in the vehicle that provides initial power for the
9 trusses that were being assembled up there and powered up for the first time that kept
10 tripping circuit breakers. And we ended up having to go do a design fix. But it was
11 during the MEIT that we actually found that problem.

12

13 Snaples: Which is much better than...

14

15 Straiton: And if you go read that article in the paper from this past Sunday it talks a
16 lot more and I'm sure he had time to go look at his notes. I'm trying to remember it off
17 the top of my head, but we found a show-stopper in that that came out through the
18 reviews. We'd of had to bring that flight article home and fix it. But we had a ton of
19 problems primarily in the man machine interface. They had what you call portable
20 computer system devices that the crew interfaced to that were developed at JSC. And
21 there were a lot of early problems in those areas. Just about everywhere you went
22 there was, we probably, the first time we ran that initial series of tests we had over a
23 thousand pieces of open problem paper.

1

2 Snaples: Ouch.

3

4 Straiton: And so we very quickly concluded that we needed to go fix the software
5 and it was going to take some time to do it. And we needed to retest that software. And
6 then retry this stuff again. And it was during that first series of these testing that we
7 were just wearing NASA guys out because we were not getting through the procedures.
8 We were taking longer than we had on the schedule. It involved a lot of support from
9 other people in the Program that we just basically took a time out after the first run
10 through with this thing. And I keep seeing you all look at your watches. I'm gonna...

11

12 Dethloff: We're worried about you.

13

14 Snaples: We're worried about you.

15

16 Straiton: Let's just keep going with this thing cause we're actually getting to the part
17 and I'd rather take the time now and get through it rather than asking you to come back.
18 This is I think why you were primarily here.

19

20 Dethloff: Right. So you took a time out.

21

22 Straiton: We were dealing with people problems. We were dealing with test
23 approach problems. We were dealing with how we were gonna maintain schedule and

1 while we're trying to fix our problems what are we gonna do with the flight hardware
2 that... this is where I think Roy decided that we need to understand from a Kennedy
3 perspective because we have a big stake in this and there's a lot of visibility. We need
4 to go figure out what's wrong, what we can recommend doing as a part of it and just go
5 do it. And find the right people to go do it. And so I remember the time Tip and Steve
6 had met with Roy and somehow I inherited an action out of that to go answer some of
7 those questions. And it was over about the better part of week that I needed to go put
8 that story together. But because I had been living it day to day for over a year and a
9 half, by then I pretty well knew what I would suggest the problems were and what it
10 would take. And a lot of it in terms of NASA doing that job and if you remember I said
11 the Payloads piece of the Organization were the actual implementers and executed all
12 of this stuff. It was a major paradigm shift for them to not think of hardware coming in
13 here as a payload and not being fully tested and we do some final formal interface
14 checks on it. The hardware came in here incomplete. It was still being built. We were
15 supporting it getting built and then we had to take over the testing of it. And we were
16 testing stuff in some cases it wasn't even there and immature software at the time. So
17 we had to get over this hurdle of it's acceptable to have hardware that's incomplete. But
18 in the interest of trying to maintain the schedule you build enough that you have
19 confidence in it's ready to test and then you incrementally go test it until you get it to a
20 point to where you think this thing's in a flight-like configuration. And then you commit it
21 to the multi-element interface testing. Because the whole concept behind MEIT was
22 you hook as much of the real flight hardware and flight software up in as close to final
23 flight hardware configuration as you can in a 1G environment. So that you're basically

1 creating an environment on the ground that you would see as you incrementally deliver
2 and build and test this stuff on orbit. So you don't do anything on orbit for the first time
3 or you at least minimize as much as...

4

5 Snaples: So you want to spend the bucks here testing rather than put all that... all
6 your eggs in one basket and shoot it up there and find out it doesn't...

7

8 Straiton: You can get a lot more people around it in a lot friendlier environment to
9 go disconnect stuff and look at stuff rather than a handful of guys on orbit in a very
10 hostile environment. So I say, and I would agree, the paper article said because of all
11 these problems we've found that we fixed them and we re-tested them on the ground
12 we've probably saved the Program a billion dollars in those kinds of cost avoidance to
13 seeing them on orbit.

14

15 Snaples: Was it hard to convince the Contractors that they didn't have to deliver a
16 completed project?

17

18 Straiton: No. They totally agreed with the need for the testing before we called it
19 complete and understood the budget constraints that NASA was under that they
20 became participants to it. And frankly we couldn't have done it without them.

21

22 Snaples: Sure.

23

1 Straiton: But this became a huge program task. And back to the action to go figure
2 out. . . we basically put together a small NASA organization that took key individuals,
3 hand picked from both those organizations. Which totaled I think we ended up with
4 about 40 people that were challenged with going the second time around fixing all the
5 problems with the testing and to get this stuff done on schedule and successful. And I
6 kind of headed the thing up, reporting or working with Steve and Tip, but I kind of had
7 the full charter to go put this thing together. And so I wanted to make sure I had good
8 guys with me. And so Scott Chandler was my Deputy for Engineering and he's the guy
9 that the article was about in the paper. And my Deputy for Operations was Mike
10 Leinbach who was Tip's Deputy at the time. And he's now your Shuttle Launch
11 Director. After we got through all that Mike was looking to go do something different
12 and so he came back out here and is launching Shuttles again. So we put the local
13 organization together but obviously we had to have the Program Flight Software
14 Community supporting us with the fixes. We had to identify what problems impacted
15 which requirements and needed to be fixed. We had to get them to fix them on a
16 schedule that we could go dry run the procedures before we tried doing them on the
17 vehicle again. We were very clear in documenting everything, starting with the initial set
18 of requirements that we had to get through for each of these MEIT test. What were the
19 issues we expected to get fixed as part of that. What software was updated as a part of
20 it. Getting it tested. The biggest thing obviously I think was the resources because we
21 didn't have enough NASA resources on this Center to go do it, between even the two
22 Organizations. And we needed to make sure we had the Contractor commitment and
23 other NASA Centers because we were dependent on the individual developers of the

1 flight hardware to provide us their Contractor support. The Mission Operations
2 Directorate because one of the series of tests that we did was an end-to-end test where
3 we basically powered the Station up in the facility over there exactly the way it was done
4 on orbit from Mission Control.

5

6 Snaples: Wow.

7

8 Straiton: So we had the MCC involved, the MOD guys, and we had the Flight Crew.
9 We had... the last big test we did we had the Expedition 1 Crew in and the Crew... at
10 the time we were running a lab hookup initialization and power up that we had that
11 prime crew in lashed up to Houston. So it was as complete an end-to-end series of
12 testing with the World Wide... and we were doing it with the World Wide Net. We knew
13 on orbit we'd be communicating through TDRS. We scheduled TDRS time. We ran the
14 thing as close to the way it would...

15

16 Dethloff: Simulated.

17

18 Straiton: ...be on orbit, simulated on the ground in a 1G environment. And we rang
19 out these interfaces end to end. Then we could start breaking the pieces apart and
20 launching them. And there wasn't a lot of other work to be done after we did that. A lot
21 of close outs; minor work that didn't effect these interfaces to any significant extent that
22 we had been testing. And when that stuff went into the Orbiter and was launched we
23 had a lot of confidence that we had tested it thoroughly and it was not disturbed

1 significantly. And we, in fact when we did the initial on orbit assembly and power up of
2 this stuff we had our guys that had done all this kind of testing on the ground here
3 available as they were doing it on orbit. If they saw any funnies our guys could say oh I
4 remember that back in this MEIT test. Here's what we did to get...

5

6 Dethloff: So everybody was getting trained and experience...

7

8 Straiton: Oh yeah.

9

10 Dethloff: ...in flight operations basically.

11

12 Straiton: Right. So I mean I'd have to admit that the first time we went through this
13 series of testing we didn't get near the results that we wanted. And frankly the last test
14 configuration we did with the Canadian Arm interfaces we had not completely run all of
15 our procedures that we would be doing in that test. We had limited the dry runs to those
16 that had safety critical aspects or a few critical functions that we wanted to get
17 performed. But it was not a thorough testing of it. And that was the first time through.

18 So when we revisited everything we wanted to make sure that we touched on
19 everything that had to work. That was a category 1 type thing that we didn't want, ^{that} ~~that~~
20 were significant consequences including maybe having to return with it here or certainly
21 delaying the rest of the launch sequence to go fix the thing. So we focused on those.
22 We got through all of them. We accomplished all the requirements except for a handful.
23 We went through a very methodical set of evaluations on those and decided the risk

1 was acceptable. But I'd say by and large the second time around on doing this same
2 series of tests we completed on schedule. We got all of our requirements done. And
3 we didn't drive the workforce in the ground doing it. Because we found the right
4 program interfaces, be it MOD, or Flight Software, or even Flight Crew, that when we
5 said we needed help they showed up. We built elaborate documented resource
6 matrixes to make sure everybody was there. And everybody I think was much better
7 prepared this second time through. And so the end result of all that is we got through all
8 that MEIT testing. It really gave the entire Program a lot of confidence that the stuff was
9 mature and ready to go fly.

10

11 Snaples: So is MEIT going to be the future. I mean is that what NASA's going to try
12 to do? I mean if it were up to you, you'd do that from here on out on the...

13

14 Dethloff: For all systems.

15

16 Straiton: It's a good philosophy. Now what we were doing at the same time as this,
17 we called it MEIT 1, we were putting together a proposal for what's called MEIT 2. We
18 got all this stuff launched that is basically up there now and then you go into the
19 launching of the trusses. You start building, once you get the initial hub there that you
20 can have a man tended capability and actually permanent man capability with the
21 Russian segments there. The next step is to start building the truss outward adding
22 more power to it and then bringing in the International Partners. So the second phase

1 of MEIT 2, which actually I kept in touch in with them, they're finishing up this summer
2 with the truss testing.

3

4 Snaples: To make sure it all works.

5

6 Straiton: To make sure it all works. There was a third phase proposed for the
7 International Partners that's probably another year or 18 months down the road. That I
8 think people are starting to get more confidence that this stuff is working, that there's not
9 near the risk with those segments as early on core segments, that I think a lot of that
10 stuff is either being eliminated or certainly reduced in scope.

11

12 Snaples: Scaled back.

13

14 Straiton: Yeah. But there were like three different versions of this MEIT testing.
15 One of the basic launch site philosophies is you want to find your problems here before
16 you launch it. You want to test it as thoroughly, as close to launch as you can. Then
17 the temptation we've got to avoid is testing it after we've tested it and continuing to test
18 it until we break it.

19

20 Snaples: Right. You can't over test it.

21

22 Dethloff: What... just very a very broad question quickly. What percentage of
23 KSC's effort now is directed primarily to Space Station?

1

2 Straiton: What... of all the people on the Center?

3

4 Dethloff: Yeah. How much of your effort is really focused on Space Station?

5

6 Straiton: Well mine personally. None. I'm back in Shuttle. I retired from NASA
7 back last September.

8

9 Snaples: Well does the Shuttle basically do...

10

11 Straiton: Shuttle has...

12

13 Dethloff: ...have any Space Station?

14

15 Straiton: Shuttle has a handful of people from the Shuttle interface perspective
16 involved with the Station activities over there. But it's more from an interface. I bet
17 there's less than 50 people working it. When ^gif you look at that organization over there X
18 today, what they finally ended up doing is combining both the Payloads and the Space
19 Station organizations into one big organization that Tip Talone has that's got to be 350
20 people strong. So they're doing Station and Payloads and I'd say probably 75% of it at
21 least, since Station is the only thing flying right now, is working Space Station.

22

23 Dethloff: And that's what I was asking...

1

2 Straiton: So you figure 300 out of the 1500 probably on the Center. There's at least
3 20% of NASA on the Center here is involved in some aspect of the Space Station.

4

5 Snaples: Well we've probably kept you too long, but we greatly, greatly appreciate
6 it.

7

8 Straiton: OK.

9

10 Snaples: Anything else you want to tell us that we forgot to ask about or...

11

12 Dethloff: That was good. I really appreciate that.

13

14 Straiton: Well I get started, I was struggling a little bit there.

15

16 Dethloff: We may come back at you, if you don't mind somewhere along the way.

17

18 Straiton: No. Feel free to.

19

20 Dethloff: But one thing in my mind is sort of where do we go from here you know.

21 And how much of the next 20 years is going to be devoted to Space Station, Shuttle?

22 How long, what about the aging fleet. I know you were, you've been kind of concerned I

23 think with the...

1

2 Straiton: Well you all have probably seen the X-33 and the 34 Programs and frankly
3 Shuttle is going to be here for the next 20 years. OK. So what can we do to it to
4 continue to make it cost effective to fly. Make it more safe, if that's possible. And a lot
5 of the upgrades they're looking at are in both the area primarily of adding additional
6 safety factors into it and continuing to try to get the cost per pound to get something to
7 orbit down...

8

9 Snaples: Down.

10

11 Straiton: ...and this project I'm currently working on, a lot of this is really, it's really
12 kind of a strange feeling that I've come back into. Because having worked Shuttle in the
13 early '80's, I haven't been involved in Shuttle until the last year. And I came back in to
14 Shuttle working an area I started out working in the early '70's with...

15

16 Snaples: Deja Vu all over again.

17

18 Straiton: ...it was the Launch Processing System that is still out there today. And
19 now we have this system on the board now called the Checkout Launch Control
20 System, CLCS is the acronym, that is the next generation processing system that we're
21 going to use to support Shuttle checkouts for the next 20 years. And so as Shuttle does
22 these upgrades this processing system has to stay in sync with that. And this project
23 has been around for 3 or 4 years and we've had a number of restructures in it. I came,

1 in fact I came on board late last year while we were going through another major
2 restructure of the thing. So I kind of got in on the ground floor of it that we have an
3 operational capability to deliver down at our hypergol maintenance facility. That's the
4 POD checkout for the Orbiters.

5

6 Snaples: Right.

7

8 Straiton: ...but the main part doesn't get delivered online until we get an OPF
9 capability and that's out in late '03. So it's a fairly long program to go do. I'm doing the
10 same stuff I did, right now...

11

12 Dethloff: 20 years ago.

13

14 Straiton: ...25 years ago.

15

16 Dethloff: Isn't that something?

17

18 Straiton: I mean we're writing, we're rewriting all of the application software for the
19 sets that have been working for the last 20 years. Can you imagine the systems
20 engineering guys initial resistance with wanting to see something new when...

21

22 Dethloff: It's been there 25 years...

23

1 Snaples: 20 years...

2

3 Straiton: It's their job on the line as far as saying this stuff's... They want stuff
4 they're familiar with and if you change anything it'd better be transparent to me. And
5 we're starting to see some change in that paradigm given that we've got to rewrite
6 everything and we're just trying to rewrite it to where it at least looks more like them.
7 But some of them are starting to embrace the idea of taking advantage of the new
8 capabilities and the technologies so. But this is where we are for I think the next 15 or
9 20 years.

10

11 Dethloff: OK. That's what we were...

12

13 Straiton: And Space Station will continue launching. I think they have the majority
14 of the manifest for certainly the next 3 or 4 years.

15

16 Snaples: 2006, yeah, or 2007. Something like that.

17

18 Straiton: And so there's plenty of good work here.

19

20 Dethloff: Good. That's good. Thank you so much. We really appreciate it.

21

22 Straiton: Well I was glad to do it.

23

1 Dethloff: I know we took a lot more of your time than you planned.

2

3 Straiton: Well like anything else, if you invest an hour in something and you're
4 almost done you want to see it through.

5

6 Snaples: We'll get the transcript to you...

7

8 Dethloff: Eventually.

9

10 Snaples: Eventually.