ORAL HISTORY TRANSCRIPT

CHARLES J. DONLAN
INTERVIEWED BY JIM SLADE
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[This oral history with Charles J. Donlan was conducted at NASA Headquarters in Washington, DC on April 27, 1998. This oral history was conducted by Jim Slade for the Johnson Space Center Oral History Project.]

SLADE: During your time at Langley, Mr. Donlan, you held a lot of important posts, beginning with the wind tunnel work before World War II. You stayed there until 1968, I believe, when you held the post of Deputy Director. What was Langley like just before the War, and what kind of projects were you doing? You must have been very much into fighter production.

DONLAN: Well, when I was a senior at MIT [Massachusetts Institute of Technology], we used a lot of NACA [National Advisory Committee for Aeronautics] reports. Even then it was a world-renowned organization, as a leader in aeronautical research. And one day Professor Joseph S. Newell, who was head of the department, came in and said, "How would you like to work at the NACA at Langley?" I said, "It sounds great." I had had a couple of other opportunities, but I went down there with two of my colleagues, one of whom remained with the Agency out at Ames Lab [Ames Research Center, Moffett Field, California] all these years. And I went down there on June 1st , '38, because of a letter that I got from John [F.] Victory, who was the Executive Secretary of NACA; and I didn't even go back for my

graduation because it was the following week. Anyway I stayed there; and one of my first jobs—*the* first job I had—was in the Langley spin tunnel, where I learned how to spin models. And in those days, every fighter aircraft of the Army Air Force then and the Navy went through spin testing. And, the boys would throw the model in and would get it spinning, and we'd have to adjust the speed of the vertical wind tunnel until it matched the gravity load. And, for some time, they didn't have a screen up at top to protect the models in case you overshot. So, after sending a few models through the fan, I proposed they put a screen up there, which saved an awful lot of models in future.

SLADE: Shot them right out through the roof, did you?

DONLAN: It's interesting, one of the first reports I wrote was called a "Spin Design Criteria for Monoplanes." This was in 1938. It was a technical note. And just this past year, a colleague of mine who flew private airplanes told me he came across a publication which recommended reading this report on "Spin Design Criteria for Monoplanes" because the civilian planes today—small planes—are very much like the designs of 50 years ago. And sure enough, I found that this magazine carried a synopsis of this report; and it's probably the only report currently [in] use, and it was the first one I wrote, over 50 years ago.

SLADE: That makes you feel good.

DONLAN: But after that, I spent about a year-and-a-half; and then I worked for about a year with Robert [T.] Jones, one of the real brilliant aerodynamicists NACA had. [He] probably comes closer to a genius [than anyone] I ever worked with. And Bob went on to the Ames Lab and did some very fundamental work in aerodynamics. And then, during the period of

the war, NACA enlarged its scope and I was involved with the design and operation of the 7-by-10, 500-mile-an-hour wind tunnel. And from the period of ’45 to ’52, when I spent as Head of the High-Speed Section there, it was a very fascinating period because all of the new jet aircraft were coming out; and in those days, before electronic controls were perfected, stability had to be aerodynamic. And, swept wings posed a big problem there. They had an induced pitch-up; and it would turn out that one of the few solutions was to place the horizontal tail below the chordl line extended. Most of that work was done at Langley [Research Center, Hampton, Virginia]. And I can rattle off all the aircraft that were redesigned based on some of the work we did there.

SLADE: So, actually, when anybody wanted to proof a design, they had to come through you.

DONLAN: Absolutely. The wind tunnel. There were other wind tunnels involved, but I was fortunate enough to be involved with a tunnel that was particularly suited to the speed range for those particular aircraft. Those were exciting times in aeronautics, and I remember in the early fifties when Dick [Richard T.] Whitcomb discovered the famous area rule. I accompanied him to a visit to General Dynamics out in San Diego during the period when the [Convair F-] 102 aircraft was under contract. And, we helped turn that whole operation around; and General Dynamics went on [to redesign], first, for the 102A, to demonstrate, in no uncertain terms, the effectiveness of the area rule. And then they went on to redesign the [F-]106, which was a perfect example of a[n] area rule application for a tail-less airplane.

SLADE: You must’ve ended up crossing the country out to Edwards frequently then.

DONLAN: Well, I was out at Edwards quite a bit, because I was also the Langley member of the Research Airplane Panel—

SLADE: My next question would go right there.

DONLAN: —which kind of oversaw the operation of the research activity. At one time, Edwards was called the Langley High-Speed Station. That was a division of Langley. And Hartley [A.] Soulé, who was my boss, as Assistant Director at Langley; also wore a Headquarters hat as the Research Airplane Leader.

SLADE: So, you got into the rockets right out of jets?

DONLAN: Rockets—

SLADE: You were doing them at the same time practically, weren't you?

DONLAN: Well, there was a lot of criticism of NASA in the fifties for not doing more in space, and some of that criticism was unfounded.

SLADE: You mean NACA or NASA?

DONLAN: Huh?

SLADE: You mean N-A-C-A?

DONLAN: N-A-C-A, yes.

SLADE: I'm sorry. Just a correction.

DONLAN: N-A-C-A was N-A-C-A until ’58.

SLADE: Right.

DONLAN: But then we had, of course, the Pilotless Aircraft Research Station at Wallops [Island, Virginia], which was very effective in particular before we had a transonic wind tunnel.

SLADE: Uhm-hm.

DONLAN: The transonic wind tunnel didn’t come into play at all until the middle-fifties really.

SLADE: So you had the tools coming along that almost—

DONLAN: Had the what?

SLADE: You had the tools coming along, but almost at pace with just exactly what you needed.

DONLAN: Yes.

SLADE: So, the X-1 through the X-15: What was your input with those?

DONLAN: Well, the X-1 was [an] aspect ratio 6 straight [wing] airplane. Now, looking back, it seems bizarre that we should ever have hoped a configuration like that would be a transonic airplane. But it did have a thin wing. We had a 6% wing. 8% was the one that [Charles E.] Yeager flew.

SLADE: Yeah.

DONLAN: And then NASA had one with 10%. And then in time there was a low-aspect ratio—aspect ratio 4—X-1E, which I had a hand in having built. And that is the wing that's on the model outside the—not the model, but the actual aircraft, outside the Headquarters building out at Dryden Station [Dryden Flight Research Center, Edwards Air Force Base, California].

SLADE: Yes. I've seen it many times.

DONLAN: So, then the D-558, John Stack was active in those days. John didn't like rocket aircraft. He thought there ought to be a jet aircraft. And so the D-558-I was his brainchild, and that was a straight low-aspect ratio wing, something like the X-1E. But, in the meantime swept wings came along and just made a whole different ballgame out of aircraft design.

SLADE: And then at the latter end of the Research Plane Program, you got into the lifting body concept. [With] the X-15, the fuselage almost flies itself, doesn't it?

DONLAN: The lifting body came in line with the design of space aircraft.

SLADE: Okay. All right.

DONLAN: And, Al [Alfred J.] Eggers at Ames was the first one that come out with the M-1, I think it was. And Langley had…[the] HL-10, or whatever it was called. We used to call them "flying bathtubs" because they had very unusual characteristics; they had what we called a lift/drag ratio of a brick. But, in due time it turned out that you could in fact design a

spacecraft *with* wings that *could* reenter and could be handled, and that's the way the shuttle went.

SLADE: Well, you were in those formative days of Mercury when NACA switched over to NASA. Did you look back to the research program—the Research Plane Program—for material ideas? For instance, you had thrusters on the X-15, etc.

DONLAN: Yes, well, we had thrusters on the X-15. Those are helpful. But I think one of the most important contributions of the X-15 was to demonstrate the ability for a pilot from 100,000 ft or more to eyeball a landing. And that was a fundamental reason why, when I was involved with the early days of the—I was the first Acting Director of the Shuttle Program—[I] insisted we could drop jet engines, which were part of our original concept, instead of having the spacecraft come down and [start] jet engines at 40,000 feet and then have to circle around and land. Because of the X-15 experience, we concluded that it was perfectly feasible and far more desirable to land the shuttle in that manner rather than to equip it with air-breathers that you had to take into space.

SLADE: It did it time and again, the X-15 did.

DONLAN: The X-15 was very, very helpful in that. And, it also was helpful in training the pilots to operate those jet controls, when they lost aerodynamic control, and to experience the transition back to the regime of flight, when their transonic controls could be operating.

SLADE: Did you know at that time what was coming? When you were looking at that kind of technique, did you have some inkling of how that might apply to the future?

DONLAN: Well, yes. During the Research Airplane Program, there was a period when the slogan was, "Faster and Higher; Faster and Higher." And, attempts were made to equip the X-15 to fly mach 6, for instance. But it turned out in the course of the fifties, when there was a lot of theoretical work done on lifting bodies and hypersonic jets, you ran into the situation where, when you fly at mach numbers 10, 12, 15, you heat up the machine, so terribly, so that it became a problem of heat protection. Then realization was, "Hey, look if you went a little faster, escape all that, go into orbit and then come on back, and you only have to negotiate the reentry instead of flying through it continuously in the hot environment."

SLADE: So I gather from that, then, the first thoughts about going to orbit was a way to escape thermal problems, and it was a way of traveling across distances rather than going into space.

DONLAN: That was certainly part of it. You could go half way around the world and then reenter instead of having to, you know, fly continuously at high mach numbers in the very high heat environment.

SLADE: Do you get a kick out of the way your ideas keep reemerging now with the . . . we're talking about supersonic transports that would do much the same thing?

DONLAN: Well, the supersonic transport is a low mach number; and, ironically, the lift/drag ratio of a mach 3 aircraft can be very high and approach that of a subsonic aircraft. The problem has been the propulsion has been inefficient and it wasn't worth doing. Now, and I haven't followed that too closely in recent years, but we know there are military jets [that]

can now go supersonic without afterburners. And, improvements in efficiency of the supersonic-type power plants would make possible the mach 2, mach 2½ transport in time.

SLADE: Yes, I'm thinking particularly of the power plant for the proposed F-22. That's the engine that can do that.

DONLAN: That would be able to go supersonic without afterburners.

SLADE: And cruise there.

DONLAN: And cruise.

SLADE: What was it like when NACA became NASA? Did people resent the shift? Some felt the Mercury Program might injure their careers, I see. Why did they feel like that?

DONLAN: Well, there *was* quite a bit of feeling of that nature. At Langley, there was a whole group who were still riding the high wave of contributing to the success of military aircraft. Suddenly overnight, this space business comes about. And we had people at Langley who refused to really get into the mode of space. And there was a lot of feeling about that.

SLADE: Didn't they take the idea seriously?

DONLAN: What happened at Langley was when Project Mercury came about in '59, Bob [Robert R.] Gilruth, who was the Langley Assistant Director, was named the leader of that program; and he asked me to be his Deputy. It was called the Space Task Group. And while we were established at Langley in a certain area, it was assigned to the Space Task Group, but administratively reported to [NASA] Headquarters. So we had that arrangement of a

program within a Center that wasn't responsible to the Center. And that resulted in a conflict of interest at times, because Project Mercury, in '59 or '60, was half the NASA budget. And, yet we had a very small group.

SLADE: Who were they? Who do you remember from the group?

DONLAN: Well, of course, Gilruth and myself and Max [Maxime A.] Faget, Chuck [Charles W.] Mathews, a group of others and Chris [Christopher C.] Kraft [Jr.], who came out of the Flight Division of Langley. About the same time that this was all happening, as NACA transformed into NASA, there was a policy group at Headquarters deciding that, perhaps, they should transfer all aeronautical flight research out to Dryden High-Speed Flight Station, in those days. Those rumors were not only rumors but initial plans to do that; they never materialized at the time. But the net result of all that was several, I would say, of the key flight people transferred to the Space Task Group. And so we had an influx of experienced flight people—aircraft—and that was very helpful when it came to the shuttle because the fellows at Houston not only had flight experience but, by that time, space experience. And the shuttle was a combination of aircraft and spacecraft; and it was an ideal undertaking for a group such as Johnson [Space Center, Houston, Texas].

SLADE: So you had a mass that moved to the West Coast, to Dryden, and then you had the Space Task Group taking up the void left by that mass of people?

DONLAN: Well, those people didn't move.

SLADE: They didn't? They stayed right there?

DONLAN: They moved to the Space Task Group.

SLADE: Only the responsibilities moved to Dryden for aircraft?

DONLAN: Responsibilities; some of it. Not all of it. It turned out, in fact, even today, there's still some political upheavals about moving all of Langley flight research out there to Dryden. So over the years, Langley has continued to do flight research. But all I'm saying is that the result of the moment was, we had a group of hardcore flight research people into the program, and that was great. In addition to that, the Canadian [AVRO CF-] 102 aircraft was canceled because the Canadians, because of the developments in the intercontinental ballistic missile world, they had concluded that the top defense against that was not another supersonic aircraft. And so they canceled the airplane. And, that was a whole corps of people thrown out of work. And we got a visit from Bob Linlay, I believe, and [James A.] Chamberlin to our Space Task Group saying they had some experienced people up there and perhaps we could find a role for them. So a group of us went up there—Gilruth and myself and Paul [E.] Purser, Chuck Mathews, maybe a couple of others—and, in the course of one weekend up there, we doubled the size of the Space Task Group.

SLADE: You brought in gold, didn't you?

DONLAN: The State Department was working with us; and 2 days later we had some of those people down at Langley.

SLADE: Excellent.

DONLAN: Because they were able to expedite the transfer.

SLADE: So, when it comes to, and I'm not talking about *inventing* Project Mercury as a concept, but I'm thinking from the point of actually building a spacecraft that would fly in space and deciding what was necessary to do that: How large was that group of people that actually came up with what we came to know as Project Mercury?

DONLAN: In the fundamental spacecraft concept, there [were] probably not more than a half a dozen people involved with that. Max Faget [and] Caldwell [C.] Johnson were probably the two most influential people in that design. And operationally, Mathews and Gilruth had a lot to do with it. The rocket part, of course, was the Atlas; and our contributions to that were really that of project managers, utilizing the lift capabilities of that. We had nothing to do with the propulsion, except for the interface where Mercury had to be set on top of the Atlas.

SLADE: Did you have anything to do with man-rating the Atlas? I mean, that called into some redundant systems into the system and so forth.

DONLAN: Well—

SLADE: You had to set specs for it, didn't you?

DONLAN: Yes. Man-rating was involved at that extent, and probably through more intense scrutiny of the production process.

SLADE: Okay.

DONLAN: That's really what it was.

SLADE: Well, that must've been a hectic time, in coming up with a design. You didn't have a great deal of time to do that in, did you?

DONLAN: There were some problems. Like, I think Dr. [Hugh L.] Dryden wanted a metallic heatshield, for instance; and at that time the ablative material was fairly new, and there wasn't enough experience with it; and we had built a metallic heatshield—[a] beryllium heatshield—for the Redstone Program. But in due time it turned out that the composite heatshield was the way to go. And that's the way it went.

SLADE: And that became very expensive.

DONLAN: Avco was involved with that up in Lowell, Massachusetts.

SLADE: But the time element. I'm still fascinated by how quickly it was done. How little time did you really have to come up with something that was useful?

DONLAN: Well, one of the interesting things is that we had the responsibility of decision-making. It didn't have to pass through a bunch of committees. And, that was very instrumental in being able to decide something and go ahead with it. I ran into that myself during the astronaut selection program. Bob [Gilruth] had given me the responsibility of doing that, and in the course of 2 months, after a bunch of interviews, we had one meeting at Langley when I went through the maybe 25 candidates by that time. And, in the course of 2 hours, [we] came up with about a dozen and called in Gilruth; and we just decided on seven, and then the next half hour I had contacted them by phone. Now you couldn't possibly do that in these days, you know, without a lot of criticism. Unfortunately, the only criticism we

ever really got was, some claimed it was a loaded selection because there was three Air Force, three Navy, and a Marine. And that was purely accidental.

SLADE: And the Marine became the first one to fly in orbit.

DONLAN: The Marine, yeah. And he was not added because he was a Marine, I'll tell you.

SLADE: Let me ask you tangentially, how do you feel about him flying again?

DONLAN: I think it's fine. You know, he was one of the first fellows I interviewed in the course of selection of the Mercury astronauts. And he came into the office with a Marine uniform on and a yellow envelope under his arm. And it was some [Navy Aviation Medicine Acceleration Laboratory in] Johnsville [Pennsylvania] centrifuge runs. He already had been involved with some of that research that the Navy was doing, and he wanted to show what the tolerance levels were. And then before he left that first day, he asked if he could come back that night and look at the Mercury drawings. Now those are the kind of things you look for when you evaluate a man's suitability for a job like that.

SLADE: And, of course, for the casual observer of this tape, we're speaking of John [H.] Glenn [Jr.]. And, he struck you as the kind of personality you wanted; yet on the surface his personality is very different from the other six—at least on the surface. I don't know how to put my finger on that. Did you see similarities?

DONLAN: Well, over the years, he's cut from a certain mold. But we were looking for people who could really do the job and contribute information for that job. And, John initiated the F-8U flight across the country, for instance. That kind of initiative, too, is what you look for.

So we weren't comparing personalities as such. I know there was one man we interviewed thought that we ought to take half a dozen people from the Patuxent [Naval Air Station] Flight Group, half a dozen people from the Andrews—not Andrews, but the Edwards Flight Corps. Well, we wanted to avoid cliques by all means. What we wanted to do was have a mixture of people who could contribute into different disciplines. And if you look at the first seven, you'll find that they all had a little different discipline to contribute. And that was part of the reason they were selected.

SLADE: All right. Let's get just a little more detailed. Oh, there was one question I wanted to ask you before we go ahead, and it doesn't have any—you headed the team that evaluated the contractor proposals for Mercury. Why was McDonnell Aircraft Corporation chosen? Why was their proposal taken?

DONLAN: Well, the source selection weighs all the factors, and they had the best proposal. In our judgment.

SLADE: All right. They were able to fabricate what you wanted that fast. All right. That was just a point I wanted to get on the record here. But, let's go back to the astronauts that I think are endlessly fascinating. Who was on the team that set up the selection process for these guys?

DONLAN: Well, after the decision was made by President [Dwight D.] Eisenhower that he didn't want to see a national campaign for . . . a posted campaign to select astronauts. He was convinced that somehow the space program was a temporary thing that would go away and let's not stir up too much. You've got a bunch of seasoned test pilots in the Defense

Schools, the Air Force and Navy had. Take them from the rolls of the Department of Defense files on pilots. So Gilruth came to me and said, "Hey, look, I want you to make this your top priority. Pick whoever you want; I'm putting you in charge of the selection program. And I don't want to hear anything about it until you're ready to tell me who the final candidates are." Now that's known as really delegating authority. And, I did! And I selected Warren [J.] North, who was a test pilot himself at Lewis [Research Center, Cleveland, Ohio] at one time, and several of the service fellows who were assigned to us by the Navy and Air Force: Stan [Stanley C.] White, Bob [Robert T.] Voas, and a couple of others. And, then we went up and I had them screen a bunch of the records. They'd come up with something like 550 potential records from the Defense Department. And from that I finally agreed to—I don't know—maybe over a hundred or so. The idea then was to call these groups in; maybe 3 groups, 30 or so at a time. And, the first announcement of that, they were given sealed orders to come in with their uniforms to the Pentagon. At that point they were told what the program was about, and that if they wanted to continue hearing more about it and thought they might participate, then we would set up some meetings here at Headquarters. And I was in charge of that operation. I had myself and Warren as one group; and then we had some of the psychologists and medical people. And, we would arrange to have an hour or so meeting with each person. And then in the evening, I would get together with the lead of the other group there and discuss the people and make a temporary rating of it.

Then after the course of 2 weeks, we had about 85 people, all of which, from my judgment at the time, could possibly fill the bill. And, so I halted it. I didn't even complete the complete list because we had enough in those days. And those fellows were sent out to

Wright-Patterson [Air Force Base] and Lovelace [Clinic] for various kinds of checks. In a sense, the astronaut program was a research program for those people, too, because they had topnotch people and they could give them all these kind of tests. And, the astronauts, that's what they mostly remember: those tests. But those tests, per se, had little to do with their actual selection; because the only questions I ever asked finally was: "Are there any physical or mental reasons any of these candidates should be dismissed?" If the answer to that was "No," they were on a list.

SLADE: You had—what were your criteria for these folks? What I have written down—and check me if I'm wrong—less than 40 years old, less than 5 foot 11, excellent physical condition, bachelor's degree or equivalent in engineering or physical science, test pilot school graduate, minimum 1500 hours qualified jet pilot. Is that it?

DONLAN: Now those were the original specs. And those were put out before we even had a campaign under way to select the astronauts.

SLADE: Okay.

DONLAN: And some of them, as I interviewed them, had read that information and had already discussed with their spouses whether or not—if they got a call, they might be willing to participate.

SLADE: That's wonderful. You've been asked the question over and over and over again; it wouldn't be fair on this tape if we didn't. No women? What happened?

DONLAN: Well, the basic reason there was no woman is that the President of the United States said, "Select them from the graduates of the Flight Test Centers." There weren't any women in there.

SLADE: So it truly was the President—

DONLAN: The number one—

SLADE: I'm sorry.

DONLAN: —category. Now, it turned out Dr. [W. Randolph] Lovelace [II] thought it'd be a good idea to have a woman. And he didn't talk to me about it, but he did talk to Gilruth. And Gilruth essentially told him what I told you, that this wasn't a program to equate the sexes and capabilities. We had a job to do. And, the President streamlined it for us by saying, "Select them from experienced test pilots."

SLADE: So, it was a *presidential* decision that there be no women in the original first—

DONLAN: There wasn't a decision there wouldn't be any women. He said, "Select them from the graduates from the Test Pilot Schools." And there didn't happen to be any women from the Test Pilot Schools.

SLADE: You showed them the Mercury capsule.

DONLAN: Showed them drawings.

SLADE: You showed them the drawings of the Mercury capsule. And as you said, John Glenn even asked to see it himself. Go ahead, you were going to say something.

DONLAN: Well, what one of the—we would spread the drawings out and acquaint them with what at that time was the situation, and ask them if they thought there was any legitimate role for the test pilot experience. A lot depended on how they answered that question. Some would look at it and say, "Uh, I guess not." Well, others would say, "My God, this is a pioneering venture. Of course."

SLADE: And that was the answer you were really wanting for that question.

DONLAN: We just wanted to sense them out. Actually, some of us said, "The only criteria we were using was those commonsense [ones], how you select any pilot for a situation." Some years later—in fact, about 2 years ago when I was down at Johnson as part of the Aerospace Safety Advisory Panel activity—I asked to sit down and chat with the current group of guys who initiate and select the astronauts. And we sat down for an interesting couple of hours with George [W. S.] Abbey and his key guys there and discussed it. And it's surprising how little [has] changed in the criteria and the manner in which they select these people. Except there were far more highly qualified *academic* candidates now than we had in those days. Those weren't even a consideration in those days.

SLADE: You were looking for–

DONLAN: Because we weren't looking for mission specialists. We were looking for pilots really.

SLADE: All right; good. When did you know who the first seven would be? And I know this sounds repetitious: But, at what point did you know it? And at what point did you carry that list to Gilruth?

DONLAN: I knew it after the first 2 weeks I interviewed what my key guys were, providing they didn't come up with any physical or mental [problems], and some did. I won't say anymore about that. But those tests did reveal some discrepancies like that. Some medical; some mental. But, for the most part, those were made to screen out stuff that you might not recognize until it was too late in the program.

SLADE: Who was your favorite? Is that an unfair question?

DONLAN: I don't think that's a very fair question. In fact, I never listed the order of choices of those fellows. But, at the time, we weren't sure, and I asked, Gilruth and Dr. Dryden if we could have some backup *NASA* pilots. That didn't go over too well with the military people, who thought somehow they would be given an unfair advantage. And, I did interview a couple; but none of the pilots at Edwards were interested at the time anyway.

SLADE: Yeah, I remember—

DONLAN: Because they were part of the experimental test pilot, anti-astronaut syndrome.

SLADE: That was the Spam in the can and the—

DONLAN: Yeah, right.

SLADE: —flying monkeys, and all those—

DONLAN: Yeah; yeah.

SLADE: —disparaging remarks we all heard at the time. Neil [A.] Armstrong was at the Test Pilot School and was flying the X-15 at that time.

DONLAN: Yeah.

SLADE: Was he even considered in the original group? Or did he come later?

DONLAN: He wasn't considered in the original group because he was a NASA pilot— active. And, he did have an opportunity to be interviewed, but he declined it.

SLADE: He and Joe [H.] Engle were both in that group, as a matter of fact, at Edwards.

DONLAN: Who was the other one?

SLADE: Joe Engle.

DONLAN: Oh, Joe Engle; yeah.

SLADE: Yeah; yeah.

DONLAN: No, they were—they came later when they realized that this wasn't going to be a program that would be put in the closet after its completion, and that was the end of space.

SLADE: Was that part of it? Was that particular group convinced that it wasn't going to last? It was just a fad, and it would go away.

DONLAN: Hard to say. Part of it, I think, they began to realize, too, that the Research Airplane Program had come to an end. That the need for another research airplane after the X-15 didn't exist. So that had a lot to do with their attitude.

SLADE: My question—

DONLAN: And a lot to do with the attitude of the Society of Experimental Test Pilots.

SLADE: Michael Collins, Joe Engle, Neil Armstrong, and quite a few of them came out of that program out there.

DONLAN: I'm not sure all of them harbored the same view that some of the group did, about "Don't be a Spam in the can."

SLADE: Yes.

DONLAN: But, I think they all saw the beginning of the end—you see, the X-15 in the end was advertising for *payloads*; not as a research vehicle for flight, but as a vehicle for testing payloads in space. So there was a change in the whole concept of flight.

SLADE: Let's come back to the management table. What kind of discussions were taking place among all of you at that time? You must've had some great doubts, along with the great anticipation you had. What were you talking about behind the scenes?

DONLAN: You mean in Project Mercury?

SLADE: Yes.

DONLAN: Well, there was a great concern that if you had a catastrophe. There was a lot of talk about having a risk assessment analysis made. And, we were required to fly an unmanned vehicle and the animal before we had a manned flight. But if you try and assess the relative risk of flying unmanned and flying with a man, just how you put the input of the man in there is a very subjective judgment. And in the end, none of the mathematical attempts to do that were successful, in the sense that, with so many sources of possible error, you might have a .3, a .4 success for an unmanned vehicle. A .3/.4 batting average [in baseball] you'd think was great, but in space it's terrible. But on the other hand, there are certain things you could do with a man's presence that might up that to the 8/9 category; 8.9. But, who would believe that kind of a back-of-the-envelope computation? So the best thing you do is scrutinize the engineering and production to the best of your ability and go with it. And that's what we did.

SLADE: You bite the bullet and trot on off.

DONLAN: That's pretty much what you still have to do.

SLADE: Wasn't the man your weakest link, the least *understood* element in the equation? The man was the hardest to define, wasn't he?

DONLAN: Well, hard to define because you never knew what accidental event might take place that might require his judgment. And that did happen on a couple of flights, finally, you know. And, they weren't planned. Gilruth had a saying. He said, "We try and plan for the unknowns. It's the unknown unknowns that you have concerns about." And that's what you're talking about, when you're talking about risk assessment.

SLADE: Were you, at the same time, working with the physicians who were trying to say, "Here's what we expect the human body to do under these circumstances." Was that giving you fits?

DONLAN: Yes. As a matter of fact, there was a concern that there wasn't enough work done with animals before we sent a man up. There was a group under Dr. Hartcherig, I believe his name was—a presidential group—[that] came down and went over the whole medical activity with our medical people. They went out to Edwards and looked at the flight records of the physiological inputs for flying, then came back and they made a recommendation that I remember, here at Headquarters one Saturday morning, that the Redstone Program would be all right. That's a short-duration flight. But before you fly a man in orbit, they proposed having a centrifuge program at Johnsville with some primates that would be tested, what they say, "over the hill." And that was just a blockbuster. That would have put the program back, I don't know how long. But fortunately, about a few days later, [Yuri] Gagarin went into space, and that was the end of it. But the lingering doubts are still there, you know. And it turned out Glenn did all right.

SLADE: His eyeballs didn't float out of his head. He could swallow; he could breathe; he could function.

DONLAN: Yeah.

SLADE: I remember him saying all of those things that they thought might happen to him. But, everything was just great.

DONLAN: Yeah.

SLADE: Well, after Mercury was under way and before President [John F.] Kennedy set his goal of a landing on the Moon inside the decade, you were involved even in the early discussions of Project *Apollo* Moon missions.

DONLAN: Yes, we had a number of—

SLADE: Even at that point.

DONLAN: —studies going on, not only at the Space Task Group but Langley had a group under Clint [Clinton E.] Brown. And Clint Brown's group was the one that really concentrated on a circumlunar flight with lunar capsules landing from orbit around the Moon.

SLADE: Right from the beginning.

DONLAN: They were one of the first to do that.

SLADE: At that point, that was—what?—1961? 1962?

DONLAN: 19—1960, maybe.

SLADE: 1960. That early on? Did you support that? Or did you think of doing it from a Space Station first? What was your position at that point?

DONLAN: Well, the studies we were making were space station versus maybe a circumlunar flight. And, I didn't know at that time—I say at that time, I was in the Space Task Group—I didn't know at that time that Clint Brown, across the corridor almost, at Langley was actually

looking at landing capsules on the Moon. And one Saturday morning, Dr. [Floyd L. "Tommy"] Thompson, who was head of Langley at the time, asked Gilruth and I to come in one Saturday morning and hear a briefing on some space station rendezvous activity that Langley was doing, that they were going to present at Headquarters the following Monday and Tuesday. So we went in and listened to this, and in the course of it, they gave us this presentation of landing from lunar orbit with capsules on the lunar surface—lunar orbit rendezvous. And that was the first we had heard about it.

And the next day, they went up to Headquarters and gave it up there. And in the audience was—oh, I'm thinking about the fellow who finally became a kind of a St. John the Baptist for the lunar orbit rendezvous mode. Houbolt. John [C.] Houbolt. And, you know, John thought that was great. Of course, he was at Langley, but he'd headed up the Headquarters committee on rendezvous for space stations. Then he heard this appendix presentation on lunar [orbit rendezvous], and he got all enthused about it; and he came back and from then on, he was [an] avid advocate of it and did deserve a whole lot of credit for bending back the objectors.

SLADE: To sort out the thinking, though, at that time: You were thinking Mercury, maybe Gemini, then a space station, *then* to the Moon? Is that the way you were thinking it should be done?

DONLAN: Gemini kind of came into the picture with a realization that we had no rendezvous experience. And, so the Gemini Program really was sandwiched in between Mercury and Apollo; and we learned a lot about the rendezvous activity from Gemini.

SLADE: And it got its start—Gemini—apparently, the seeds were planted for Gemini, it got started in that briefing on lunar orbit rendezvous, didn't it?

DONLAN: That could be. I couldn't swear for certain that that's how it came about. But there was a feeling that there ought to be something, some more experience beside Mercury into a more useful-type capsule. Gemini was a two-man capsule.

SLADE: So, what were your original visions of Apollo then? If you were thinking about it that early on, what concept were you thinking of? Before the lunar orbit rendezvous concept?

DONLAN: Probably, a lunar orbit mission as opposed to a space station. For instance, Clint Brown at Langley told me he had come to the conclusion that just a space station after Mercury wouldn't be considered a really a big enough advancement in activity. And so he started his people working, with Thompson's approval, on not only a lunar orbit rendezvous but on lunar landing. They had a contract with Chance-Vought [Aircraft Corporation] people at the time; and one of their people down there worked on a similar thing, I think, on the contract to Langley. So the thing kind of kept pushing; but by no means was the decision made at that time, because there was still a lot of interest in the brute force method of getting to the Moon. And, the lunar orbit rendezvous mode really is the one that survived the contests.

SLADE: And you were trying—you were kicking this around in 1960.

DONLAN: Now at that time, shortly after I went back to Langley. Thompson had asked me to come back as his Deputy, and I finally decided to do that, but keeping close ties with the

Space Task Group. Because Langley was doing a lot of the work with simulators and things like that. So, we had a very close relationship. And, I remember Clint Brown, not Clint Brown but Houbolt, coming into my office when I was back as Thompson's Deputy there—

SLADE: In '61.

DONLAN: He told me about the problems he was having in the rendezvous committee he was heading up, trying to get a hearing on the lunar orbit rendezvous mode. And, I suggested he write a minority report, which he did do and passed it on to Bob [Robert C.] Seamans [Jr.], who passed it on to [D.] Brainerd Holmes, who passed it on to Joe [Joseph F.] Shea. And the next time I heard about it, Joe Shea and a group from Headquarters were coming down to brief the Space Task Group people on the lunar orbit rendezvous mode. I was invited to go over and hear it, and I took Houbolt along. And they concluded at the time that that was the thing to do, but they felt they ought to have another group look at it. So they had another contract made; and [Houbolt] said that was a complete waste of time. He knew all the time that that's the way it ought to go, but I told him, "Well, it's a billion dollar enterprise coming up, you have second opinions, even for appendicitis."

SLADE: And what's so fascinating to me, Mr. Donlan, is you're talking about *planning* this before President Kennedy made his announcement of the Moon within this decade. You guys pretty much knew what the path would be before it was ever presented to him, didn't you?

DONLAN: Well, you know, Gilruth wasn't present at that meeting that Dryden had with the President and his staff. And, it's a mystery to me just what convincing argument persuaded

the President that that would be an undertaking that was not only worthwhile but had a strong success—a big capability behind it. It's always puzzled me, because we hadn't thought about landing so much on the Moon as just studying about it. But here's now a national commitment to do it. Now without that national commitment, there's a good possibility we never would have done it, at least in that time frame.

SLADE: And he made his announcement right after Alan [B.] Shepard [Jr.] made the initial Mercury lift-off.

DONLAN: Yeah.

SLADE: That has always seemed like, Boy, that's a pretty big step from one end to the other so quickly. But your guys had numbers to show him; or at least, they had numbers *behind* them that convinced them that they could give him a winning argument, didn't they?

DONLAN: I don't know who the prime speaker was. Might have been Abe Silverstein, I don't know. I know Dryden was in there. But the President, you know, he must've been offered other options like space station, which as Clint Brown had concluded long before that was not a sufficiently bold step to attract the attention of the world, which was what the President wanted to do to the Russians.

SLADE: Well, let's focus on you for a moment. How did you feel that night when you heard him make that speech and out of the blue say, "I believe that within this decade we should land a man on the Moon and return him safely to Earth."

DONLAN: I was kind of flabbergasted myself.

SLADE: Where were you?

DONLAN: I was in— you mean, physically?

SLADE: Yeah.

DONLAN: I was, I guess, over at my office at Langley. But once the announcement was made and the objective clearly stated, that cleared the air and you knew right then how to proceed, with what direction you were going, and put all your energy in that direction. There weren't a lot of other options. And finally when the decision was made to lunar orbit rendezvous, that cleared the air; that cleared the air.

SLADE: It pretty well laid out your course for you, didn't it?

DONLAN: Yeah.

SLADE: Where was the Saturn V at that stage? Was it still just a gleam in somebody's eye?

DONLAN: Well, the original Saturn 1 was a Redstone research and development program, really, for multi-engine stuff. The Saturn came in when the decision was made to go to lunar orbit rendezvous and you knew what kind of a vehicle was required. It was something to put a 100,000-pound capsule up there in orbit.

SLADE: Absolutely amazing. Did you feel the technology of the time was up to that?

DONLAN: Well, I think the main concern was really the Saturns. You look back, and that's a tremendously complex motor and rocket. And with 200,000 chances of something going wrong, with all the interfaces and mechanisms at play there, Marshall [Space Flight Center,

Huntsville, Alabama] and the contractors did one hell of a job. And, we had a lot of luck, too.

SLADE: Yeah.

DONLAN: You know, it didn't— wouldn't have taken much to have something go wrong.

SLADE: I heard Neil Armstrong one time say that today they're shocked when the shuttle doesn't work every time, but they were always surprised when the Saturn V did. It always performed for them, and they were always shocked about that, too. Was it that *fragile* a system? I mean, it was very complex, and you were pushing the edge of the technology—weren't you?—with that thing.

DONLAN: Well, I think the Marshall people felt that the technology was sufficiently advanced so they could put it all together. And fortunately for the nation, they had that conviction, because they sure did it!

SLADE: They reached out and pulled things in, that's for sure. You also worked with the unmanned Moon probes at the same time. That was another part of your—

DONLAN: Lunar orbiter was at Langley at that time when I was deputy there. And that was at—Langley was the Lead Center on that. And, that was, you know, a precursor to the Apollo Program in the sense that we felt like we needed more photographic information to be able to select the landing. And the lunar orbiter was a very successful program. Primitive technology by today's standards. I have a hanging on my wall at home of the first picture of the Earth taken from the Moon. And I have to tell you that's what it is, because you look at it

and the kinematics of the situation were pretty poor in those days compared to later Viking and the recent Voyager, you know. A tremendous difference in—

SLADE: It was kind of a white blur, wasn't it?

DONLAN: —technology.

SLADE: Yeah. What was Moon ball?

DONLAN: Moon—?

SLADE: Moon ball.

DONLAN: Moon ball?

SLADE: Yes.

DONLAN: You got me.

SLADE: Okay. I thought you were a proponent of a system of pounding spacecraft into the surface to test the surface strength.

DONLAN: Oh, I didn't recognize it by that name.

SLADE: Okay.

DONLAN: But, we called them "lunar penetrators."

SLADE: All right.

DONLAN: And, there were a couple of projects that Langley proposed on that, just to see if you could find out the depth of the lunar dust. Some like Professor Gold at Cornell, he thought [that if] an astronaut [stepped] on that [it's] got to be like quicksand and [he'd] sink. So when opinions like that circulate, you think of some way of maybe finding out whether it's true or not. And the penetrators were part of that system. But I'm not sure they were ever really accomplished.

SLADE: No, I think they just skipped on past them, and went ahead with the—

DONLAN: I think one of the Surveyors went in and—those JPL [Jet Propulsion Laboratory] programs helped to alleviate concerns of that type.

SLADE: Okay. The Manned Spacecraft Center was designated for Houston in April 1962. This momentum and this path that was laid out for you was beginning to jell very rapidly at that time. And, Axel T. Mattson, Assistant Chief of Full-Scale Research, was sent from Langley by Floyd Thompson to be a liaison. He was to report to you, I believe. Mattson, in an interview, said that he was really a spy for Langley. Is that true? And, why did Langley need a spy in Houston, if so?

DONLAN: Well, "spy" isn't the word. I'm the one who decided we ought to have a representative down there. And I get Mattson—Axel to go down there. What I wanted was [an] exchange of information, because we were doing some joint programs *for* Houston—for instance, the Gemini simulator and the lunar lander simulator we had—and I felt that, because of the pace of the program, I needed somebody down there who could discuss at a moment's notice what the requirements were and how we were responding to them. Maybe

some of the people at Johnson, who didn't know Axel that well, thought he was a spy; because some of the people down there thought he was a member of the Johnson Center. But, I had cleared all this with Gilruth, and there wasn't any question about this spying business. It makes a nice story, but he was sent down there for purely technical liaison.

SLADE: Were you concerned at that time, however, that Langley might again lose some of its programs to this new Center?

DONLAN: No. No. I think after lunar orbiter, I became convinced big programs like that are a drain on a Center. Because you siphon people off, and after the program's on, it's hard to get them back into a research mode.

SLADE: Yeah, yeah. Well, wasn't it Mattson who introduced John Houbolt in Houston with his lunar orbit concept? Was—didn't he have something to do with Houbolt coming down there?

DONLAN: Oh, oh, I doubt that, because Houbolt was involved with the Space Task Group when they were still at Langley.

SLADE: Oh, okay.

DONLAN: This is before they went down there to Houston.

SLADE: All right. You pulled a coup with Mattson, though, on the water drop test of the Apollo spacecraft, didn't you? You guys went ahead and did a few tests of your own that really helped out in that respect.

DONLAN: Yeah, using the tank.

SLADE: Yes.

DONLAN: A tank, yeah. Those are the kind of things I mean. We had enough and Johnson would keep getting new people in, too; and sometime they don't realize how a research center can be helped to utilize—to solve some of the problems. So, it was kind of an education process for me, too, to spread Langley's capability down there among the people who weren't so familiar with it.

SLADE: When you came back to Washington, then, as Deputy Associate Administrator for Manned Space Flight, you made some adjustments in the way the Centers were used, though, didn't you? For instance, Houston was named Lead Center on various projects. Langley was named Lead on others.

DONLAN: Well, it wasn't until the Shuttle Program that I got involved again really with that. And I was the first Acting Director of that program. And the whole question of management came up. And, there were various schemes proposed for this thing. But I felt that the important thing to the Shuttle Program was the end product itself, [which] was the shuttle itself, the vehicle going in orbit, and that everything should be aimed in that direction. And unlike the Apollo Program, where we had a Spacecraft Center report to Headquarters, and a Launch Vehicle Center report at Headquarters, and a Rocket Group report to Headquarters—

SLADE: Watch your microphone.

DONLAN: —that became very cumbersome. And, the system of engineering, the large part of Apollo, was done by Bellcomm. By the time the shuttle came around, we now have three Centers: very well experienced, capable of doing systems engineering on their own. And I felt [that] Houston in particular with the corps of flight people—aircraft people—not only from Langley but from industry, from Canada, were ideal people to handle this part of the program. Instead of trying to build up another large group at Headquarters, where it's difficult to maintain technical competence for long periods, I conceived an idea based on my Langley experience with lunar orbiter of having Johnson as the Lead Center with a Headquarters staff here doing the job of policy-making, and having the launch activity and the booster activity handled by Marshall and Kennedy under this Lead Center concept. And it worked great, for about 8 or 9 years. You get on to a Level I/II, meeting, you couldn't tell where those people came from unless you knew who they were!

SLADE: It did work.

DONLAN: And it really fell apart mostly after the first several flights of the Shuttle, when key people left, new people came in at Headquarters, the Centers, and they didn't adhere to the rigor of the management structure that we had laid out.

SLADE: Let's go back. You were Deputy Associate Administrator for Manned Space Flight at the time of the first lunar landings. Am I correct?

DONLAN: Yeah. I had a dual role there. I kept that activity; but for 3 years my main job was getting the shuttle under way.

SLADE: During that period, though, you had to be dividing your attention. And, what was it like around here, at the time of the first landings? Was it triumph? Was it fear? Was it perplexity over this complicated thing that's going on? What was the ongoing tempo of Headquarters?

DONLAN: You're talking about Apollo now?

SLADE: Yes, during Apollo. Yeah. What was it like at that historic moment? I mean, you had a grip [on], or at least you were a part of, something that will affect mankind as long as it's on this planet.

DONLAN: Yeah, in fact, I think I was at home at the time President [Richard M.] Nixon spoke. And we had a television screen with Nixon on there, speaking to Armstrong, I guess it was. And I remember taking my camera and getting a picture of that. But, just quiet exuberation, I guess. And, [Dr.] Tom [Thomas O.] Paine, of course, was the Administrator at the time. He arranged to have this big celebration dinner out there in Los Angeles. And I remember asking at the time, I said, "Aren't you somewhat askance at the poor public relations that will come from NASA spending all this time and effort on a celebration way out there?" And his attitude was, "Look, this is a tremendous accomplishment for the world." And, he sees nothing harmful in having the Agency involved, [to] get some benefit and enjoy a moment of celebration. So that's how he justified the big state affair we had out there.

SLADE: How long did it take to soak in exactly the enormity of what you guys had accomplished? How did it—was it there with you all along? Or were you apprehensive?

What happened afterwards? Did it—? My Lord, it was a—it was an amazing accomplishment in the history of humankind.

DONLAN: Well, Apollo 13 was a very sobering experience. And, it can happen once, it could happen again. Before you take all the steps, you know how to avoid it. There was never a nonanxious moment during the launch. Or even during the activity going to the Moon and coming back or landing on it. You were always apprehensive about some possibility because there's no escape from catastrophe.

SLADE: That's right.

DONLAN: Unlike *Mir*, which has the lifeboat on it, you know. While there have certainly been exciting moments up there, there's a lifeboat. Apollo 13 didn't have a lifeboat, and—hard to say. You just have to live through it. But, we were very lucky to come through without some fatality.

SLADE: It was such an accelerated time. Does it all seem like a blur now?

DONLAN: Seem what?

SLADE: Does it all seem like a blur? It was so compressed and so accelerated in those years.

DONLAN: Yeah, it's kind of interesting to see a revival of interest with the recent movies. Of course, the public is so attuned to melodrama on the TV now that few would realize that Apollo 13 wasn't quite the way it shows in the movie, you know. And *The Right Stuff* wasn't quite the way the astronauts behaved. And, there weren't quite the arguments as intense as they're portrayed in some of those films.

SLADE: They're human beings, with a certain amount of self-concern. That brings back another question. The astronauts were often given the credit for being involved in engineering/technical decisions. Did they actually take part in that kind of thing?

DONLAN: Well, they took part as a *team*. They were assigned certain responsibilities as a team. But, as far as any one of them coming up with a singular idea that dominated the completion of that activity, I can't think of any.

SLADE: Okay. space shuttle. Here came the shuttle, after a certain hiatus after the Apollo-Soyuz flights. Of course, space shuttle was under design for quite a long time up to that time.

DONLAN: You're asking about Phase A—

SLADE: Several iterations—

DONLAN: Phase B.

SLADE: Yeah.

DONLAN: Several Phase B extensions. We had something like 20-odd different configurations—

SLADE: Yeah.

DONLAN: —going through the mill before we decided on what to do.

SLADE: Did you like anything better than the one you got?

DONLAN: Well, look around. All the attempts to duplicate it with another vehicle have fallen through. Japan, England, Germany, France, Russia . It's a pretty good machine; and I think it's going to be around for a while.

SLADE: Did you think that we should have built the space station concurrently with the space shuttle to give it a beginning and a end? A place to go, a place to come back? That was the original concept, as a service truck for a space station. But then suddenly it was given—

DONLAN: Well, I think you have to hark back to the Presidential Study of '69: the grandiose, unitary plan idea where you build a shuttle, then build a station, and then a way station to the Moon, and then a way station to Mars. The grand plan that was conceived at that time where the shuttle was simply the first step. But it turned out it was the only step that survived, because the rest of the plan was so mind-boggling in the financial implications that the whole thing was dropped except for the shuttle. That was the first step. As time went on, people forget that the shuttle was simply supposed to be a first-step transportation system.

SLADE: Are you still a supporter of space station? Or do you think we should go on to the Moon?

DONLAN: No, I don't see any point in really going on to the Moon. We're going to learn a lot from the space station, just as we've learned a lot from the *Mir*. And, going on to the Moon or Mars, until, in my judgment—until there's [an] expeditious way to get to Mars, the idea of a 9 months' trip out there and back is an unreasonable thing to expect to undertake, particularly in a zero-g environment. Now they'd get to Mars, and you know what kind of condition they'd be in.

SLADE: You're convinced, then, that more time on space station is going to be profitable for us?

DONLAN: Yes, I think so. Now, furthermore, it's an international venture. Sure is a lot better than trying to choose up sides in a Cold War. And funding all the necessary defense activities that might be needed by different nations and whatnot. Have them spend a little money on the space station; they'd cooperate.

SLADE: As you've done to me all through this interview, you anticipated my next question. You're satisfied with the Russian arrangement, then?

DONLAN: I think it's a bold arrangement. I was a little apprehensive at first. But as time has gone on, and the experience on the *Mir* has convinced, I'm sure, the Houston people that the Russians are pretty thorough in what they do. The idea of calling the *Mir* a bunch of trash is an uninformed opinion. You know, it's more like a ship that's carried with it all it needs to repair as opposed to the shuttle, which if something goes wrong you wait until you come home and fix it on the ground. But not a year-long space station. So we're learning a lot about how to anticipate problems on a space station already by our experience with the *Mir*.

SLADE: After you retired from NASA in 1976, you became a consultant to government and industry. What groups were you involved with? And how did you maintain your involvement with the space program? I know you've never—it's your first love, and you've never given it up.

DONLAN: Well, at that time, the Defense Department was still very much interested in a partnership with the space shuttle for military uses. And as you may know, some of the requirements for the shuttle—like the payload bay size and the heat-protection system—were dictated in large part by military requirements, like the ability to fly a course over Russia and back out again in one orbit. Now that was a 1200-mile cross-range was behind that. And, the shuttle was designed to do that with this heat protection system. It would have been much easier if we hadn't had to do that. And also the 15/60-foot long payload was that, too. It turns out, in my judgment, those were good things to have been done in any event. But, as far as the rest of the Shuttle Program goes, we had conceived it as a launch vehicle that could carry almost anybody's payload up in multiple fashions, if necessary.

And Hughes, for instance, designed the four-pancake-type satellites that could be launched up there from the 15-foot diameter station and take advantage of the checkout and the ability to bring it back, if necessary. All that went out the window precipitously when the organization called SIG was formed—Space Interagency Group—with the representatives from not only the Defense Department but Commerce and Transportation and whatnot, and one man from NASA who was always outvoted. And, when Transportation was given the green light to develop civil transportation, they took the position: "Well, if you're going to give such benefits to the shuttle as marginal costs, we can't compete with that." So all that was thrown out. Carefully documented economic justification for the shuttle was thrown out with that one preemptive toss. And, people have been crying ever since about the high cost of a shuttle flight. The cost of the shuttle flight is almost inverse to the proportion of the number of flights. If we keep talking about $1500 a pound without talking about how many flights that takes, it's just idle chatter. And, even today, if the shuttle could fly 14 flights—15

or 14 flights—and be released to take civilian payloads on a cost-benefit basis, it could still be competitive for the expendables.

SLADE: And that's what the private contractor [United Space Alliance, USA] that's taking over the shuttle is beginning to talk about.

DONLAN: That's what it might take. Because Congress still has a concern about, justified or not, we shouldn't use the shuttle at the risk of human life to launch a commercial payload. That's been the position. NASA's never been released of that responsibility. So if you talk about economics of the shuttle and rule out all the things that could make it economically feasible, it's just idle chatter.

SLADE: Very good. And you went into retirement; you went into what after you retired from NASA?

DONLAN: Well, I was asked by the Institute for Defense Analysis [IDA] to apply myself to the use of the Shuttle by the Department of Defense. And that's how I happened to keep close contact with NASA; because, we worked for—we put out a report a year for 12 years on military uses of the space shuttle. And I was involved—heavily involved—with that and kept very close relationships with NASA. So, I was able to track what was going on with the shuttle, as well as people over here at NASA.

SLADE: I wanted you to make that point for me. We'll sum it up: You began your career before World War II, and the dramatic airplanes that produced, and continued through space shuttle design; a *fantastic* sweep. What's been your favorite moment?

DONLAN: Favorite moment. Aeronautic-wise, the period between World War II and Korea probably, that saw the evolution of the modern jet fighters and the close involvement I was able to have with both the Navy and the Air Force, was a very satisfactory period, when you can see the things you are doing translated into actual use. The F8U was a prime example of that. Conrad Lau, who was the Vought engineer, died at a young age, but Connie spent days with us down there with new innovations: in-board ailerons, leading-edge chord extensions, always were the first on an airplane. And he was able to get them translated from the experience in the wind tunnel out to the airplane; and I remember going out there on some of the first flights where they were flight testing. And to see that carried through is a tremendous satisfaction.

SLADE: It was a different time. As you said early in this interview, you could make a decision and you could go do it. It's not like modern government today.

DONLAN: That's right—hard to do it. On the Apollo/Mercury Programs, I guess I'm always satisfied I did a good job on the astronaut selection, and the experience there will be with me for a long time. The shuttle? My main satisfaction is the management system that works so well and its development; and which has been proved by the people involved through all these years, as satisfactory. IDA? I was instrumental in having certain things. First, that we were able to make a case for eliminating the insertion of payloads before they were completed on the pad; things like that. And I don't know what else is involved here, except that my involvement with the people and my satisfaction I have in appointing certain people who keep getting recognized and supporting them to do the job they're asked to do; great satisfaction.

SLADE: Any regrets along the way?

DONLAN: Excuse me?

SLADE: Any regrets along the way?

DONLAN: I can't think of anything that I would really put out as a regretful stage. Except you grow older, and time passes you on, and you have to let it go to younger people and carry on. But you can follow it with the same enthusiasm.

SLADE: That's wonderful. How important is this space endeavor to this country and to the world, Mr. Donlan?

DONLAN: Well, people don't realize how much of their everyday life they owe to the space and the Defense Department activity that grew out of the research activities needed to support those ventures. You know, GPS [Global Positioning System] is a prime example. And the television itself and the communication problem. We never would have had Apollo if we hadn't been pioneering a way to communicate quickly, instantly with tubes, in those galvanized efforts to assure that technology was ready when we needed it.

SLADE: And you've been right there in the middle of all of it.

DONLAN: Yeah. And I've enjoyed it all, every bit of it.

[End of Interview]