Conway: I’m Erik Conway. Just for the microphone’s sake, I’m talking to Dick Whitcomb at his home in Tyville [phonetic] Lane, Hampton [Virginia], on the 20th of January in the year 2000.

Let me explain my project. I’m working on the history of the supersonic transport for NASA. It’s a three-year contract, and eventually it will get published, hopefully, through the Johns Hopkins University Press. I want to talk more broadly than just about the supersonic transport stuff. I will start out with biographic data, then I want to talk about the SCAT program, then the supercritical wing, and then wrap things up with wing lifts and maybe talk about computers and aerodynamics.

So let’s, first off, start off with a little biographical stuff on you, where were you born, educated, etc.

Whitcomb: Maybe you already have it. The public affairs officers has got my official bio. They try to keep it up to date. Have you gotten that?
Conway: Yes. What I’d like to do for future historians is get it all in one place, you know, sort of on the interview. It doesn’t have to be detailed.

Whitcomb: Okay. I was going to get that thing for you.

Conway: Yes. I can get that stuff from them. But that’s what I like to do, just sort of get it in your words, and that sort of thing, all in one place.

Whitcomb: Okay. There’s a lot of words involved in that thing.

[Laughter]

Conway: Well, you can say as much or as little as you’d like.

Whitcomb: All right. Okay. I was born in Evanston, Illinois, in 1921, and I moved to Worcester, Massachusetts, with my family when I was about five years old. So I grew up in Worcester, Massachusetts. I went to Worcester Polytechnic Institute and graduated there in 1943. It was during the war years, and so we were accelerated. We didn’t have summer vacations; we just pushed right on through. So June graduation was a long-gone thing by the time I graduated.

Anyway, came down here. I had already set my sights on coming to Langley even before recruiters came around. So when the
recruiters tried to talk me into it, I said, "I don’t need to be talked into it. I want to come down there." [Laughter] Anyway, so I got down here and did what every new junior engineer does, is the horse work for the older engineers. Many people have asked me, "Did they give you a big project right off the bat?" I says, "No, I was just a junior engineer at that point."

Anyway, I have no idea how much detail you want me to go into after that point, because I could talk for hours on what I did at Langley. Anyway, what else can I say? How much do you want me to say?

Conway: Well, let’s see. I wrote a question down here. You already told me when you were hired at Langley. How about sort of a synopsis of your progression of assignments to different wind tunnels until you retired.

Whitcomb: Okay. I was assigned to the same branch throughout my career. However, my position in the branch became much different. I’ve already told you I was a peon when I first got there. Then I ran the branch. And so I was gradually working up. But my desk didn’t move more than fifty feet my entire career at Langley. [Laughter]

Conway: That’s interesting.
Whitcomb: It moved down this corridor to the main office, and that was the only move of my entire career.

You asked about different wind tunnels. Well, there were different wind tunnels involved in that branch. When I got there, the tunnel was called an eight-foot high-speed tunnel and it did not go through the speed of sound. That came later. But I was assigned projects in the high-speed tunnel. That’s a tunnel that was built and finished in about 1938, and that’s long before your time, let’s put it that way. You may have heard about it. We had a Depression back then. [Tape recorder turned off.]

Conway: All right, there we go. Looks like we’re back in business for a while. When you were talking about the eight-foot wind tunnel is when it cut off. Good grief. It’s time for new batteries. So if I can find my spares. Okay. Eight-foot wind tunnels.

Whitcomb: Yes. And I was explaining this was built during the Depression.

Conway: By the WPA [Works Progress Administration].

Whitcomb: Right. It was way overbuilt. During the war, we used it as a bomb shelter because the walls were one-foot thick concrete, reinforced concrete. But that’s a minor story. Anyway,
that’s what I started with. At that particular point, of course, when I got there, the war was on. The tunnel was made just before the war. And we were doing nothing but testing existing military airplanes. There was no basic research going on. We were entirely part of the war effort. Have you talked to anybody else about this time period?

Conway: Yes. In fact, I interviewed Manny Boxer on Tuesday, and I talked to Neil Driver and Ed McQueen and Bill Aitken. Who else? I think that’s about it. I’ve got a few more people to talk to, but I’ve been trying to get around to all you old NACA guys and get your stories down.

Whitcomb: Right. Now, keep in mind that was during the war and at that point no airplanes were going supersonic or even close to the speed of sound. They were propeller-driven airplanes. But we did a lot of research on them. I worked in the tunnels, working on those airplanes. I’m sure somebody told you that during that period we were drafted. They had to have somebody to run these—remember, aviation was expanding by a factor of ten at least, and they needed lots of people to run wind tunnel tests. But a bunch of us young guys were going to get drafted, and so what they did was just draft us, assign us to the Air Force and we worked as Air Force reserves during that period.
Conway: At Langley.

Whitcomb: At Langley, yes. Well, at Ames—you’re familiar with Ames, of course.

Conway: Yes.

Whitcomb: They actually wore uniforms. We did not wear uniforms, but we were in the Air Force. And so lots of people came at that point to dodge the draft. As I told you, when I came there, I wanted to work at Langley. As soon as the war was over, about a third of the people disappeared because they’d used us as a way to get away from the draft. But a lot of us, all the people you’ve talked to stayed.

Now, as I said, we were doing that on various airplanes. Now, shortly after the war—and, again, some of the people have probably talked to you about this—they finally penetrated the speed of sound, and they did it with the X-1. It was done by pure brute thrust. The drag was out of sight, but they had a rocket engine that drove the airplane through. But they could only do it for a couple of minutes because they were using up fuel so fast.

Then the jets came along, and the first jets were like F-86 and so forth, but then a second generation of engines came along which had much more thrust, and everybody thought that now they could get a practical supersonic fighter, using that second
generation of engines. And so they started on what they called Century Series fighters and also a B-58 bomber. Now, what happened was, our the wind tunnel--also we had at that point developed a transonic wind tunnel which would test through the speed of sound.

Conway: Is that the slotted wind tunnel?

Whitcomb: Right. The eight-foot was the first one, the one where I was working. I was still not head of the place, but at least that’s where I was working. A lot of us on the crew were working on trying to make that thing work. And so what happened was, again, just like for the airplanes, but then the tunnel was using up so much power that it couldn’t get it through the speed of sound. So I figured out, this is where my first important contribution--I had a lot of little ones that aren’t worth mentioning--but here I figured out what was wrong, why the tunnel required so much power, and figured out a way to fix it so that they could go through the speed of sound.

You said you wanted some idea of what I did. I’ve put that in there as a starting point. But anyway, we got the tunnel running, and that’s when we found out that all these new airplanes had way too much drag. So anyway, I did some studies, some basic studies to find out why the drag was so high, and I discovered what it was, and I also figured out how to greatly reduce that
drag, and that’s called the area rule [phonetic]. I got a Collier Trophy for it. It’s down at the Air and Space Museum down in Hampton.

And so we were able to get—all the airplanes did, the smaller airplanes, with the amount of power they had, could make it through. It was the bigger airplanes, particularly the B-58, just couldn’t get through because the drag was so high. Anyway, we fixed most of the airplanes with the area rule.

Now, that’s still not up to SST. That came later. Usually—it didn’t pass, anyway—the military airplanes precede commercial airplanes. They take the technology developed for military airplanes and use it on the commercial airplanes. All the way through the history of aeronautics, it’s been that way most of the time. So things like the bombers made good starting points for transport airplanes, for example.

Anyway, so we’d pretty well gotten all the military airplanes through to go to supersonic speed, and then, of course, lots of people said, "Let’s have a supersonic transport." Now, here we get into—and I have no idea how I’m going to cover this with you.

You’ve already talked to Neil Driver, and Neil Driver is still, after all these years, gung-ho on supersonic transports.

Conway: I noticed.
Whitcomb: After that first pass, the total failure, Neil went charging ahead. "We're going to get it finally." When Cortwright [phonetic] was director, he was always pounding on Cortwright to do work for the SST. And so Cortwright left, and then he came back, and we were having a conversation one time, and Neil was in there [unclear], we were still working on SST. And Cortwright said, "You're still on it?" [Laughter] Well, that comes way later in the story. We've got to tell you first about the first fiasco, not the last fiasco.

Conway: Okay.

Whitcomb: Now, whether Neil Driver likes it or not, I started on the SST before anybody else at the lab. I came up with what they finally called SCAT 4, not SCAT 1. They didn't want to give me the honor of being the first one, but anyhow, I'll get into that in a little while. That was deadly. Anyway, I came up with a configuration and primarily used everything I've learned working on military airplanes, and, in particular, a Coke-bottle-shaped fuselage which greatly reduced the drag. And so they four configurations--I think it was 1, 2, 3, 4--I don't know, but there were four of them. After we worked out the aerodynamics, did a lot of work on aerodynamics, including low-speed aerodynamics, they sent these things out to the industry to evaluate them. I'm sure that Neil told you about that.
Whitcomb: So there were three companies. I know Boeing was one, and then Lockheed was one, and I think General Dynamics was one.

Conway: Convair? North American also did some work on this.

Whitcomb: That’s right. It was Convair, General Dynamics. Anyway, so they evaluated them all, and mine came out pretty well except the direct operating cost-- [Brief interruption.]

All three of them had numbers and all three of them came to the same conclusion, that direct operating costs of these airplanes was going to be a hell of a lot higher than for subsonic airplanes.

Conway: And this is in the fifties, still?

Whitcomb: This is the fifties. I think it’s still in the fifties.

Conway: I’ve got some internal Boeing stuff from ’63 just when the national program finally started, and then I know from those documents that Boeing wasn’t convinced yet that it was an economical thing to do. They also weren’t unconvinced. I think
they're convinced now that it's not economical, and they just play along because there are still people at NASA that like that. But anyway, continue on. I just want to make sure I get the time sequence right.

Whitcomb: So at that particular point I said, "To hell with this." I divorced myself from the whole program and said, "I want nothing more to do with it."

One of the guys working on the program said, "What's the matter? Are you against progress?"

I says, "You call that progress?" [Laughter]

Anyway, later on--and I'll get into that in more detail. But we done our bit and so then the FAA, I think it was the FAA, was the one that funded building a prototype. We couldn't afford it at that time. We could nowadays, because we're now NASA, but not in those days. And so they went out and they asked for bids on it. Of course, all three of the companies that had worked on us bid on the FAA program.

One of the things--I've got to say this right here. I'm going to back off a little ways. During that whole period when we were working on it, I got a little ahead of myself there, John Stack took over the damn thing. He was running the show. And he decided that the supersonic transport should have variable sweep. I said, "No, it shouldn't. It will be too much of a weight penalty." And John Stack sent me to Siberia. I was never invited
to any more of the meetings on the SST, even though I had a configuration. He would not allow me to get involved in anybody so that I could say that that was a problem. So, as I said, I got sent to Siberia. All right. Now I wanted to put that in.

Now we’ll go ahead. So he went to Boeing, pounded and pounded on the management of Boeing, how wonderful variable sweep was going to be, so Boeing decided to bid on and build a variable sweep supersonic transport, whereas Lockheed had a delta wing supersonic transport.

Conway: So Stack went to Boeing, and Stack was the one convincing Boeing to do this variable sweep.

Whitcomb: Variable sweep, yes, right. The engineer says, "There’s too much weight involved." But the management says, "Stack has assured us it's going to be okay, so we’ll build variable sweep." After they spent a hundred million dollars of those government, not private, dollars, they said, "It’s too heavy. It’s too heavy," and they switched to a delta wing, and Lockheed raised hell because that’s what they proposed.

Conway: It’s good to know that Stack was the one convincing people. I’ve been told by Larry Lofton that he thinks Stack convinced the British to build the Concorde, too. And I have no way of ever proving that.
Whitcomb: I’ve never heard of that one before.

Conway: Several people have and a couple of them haven’t, so that’s interesting. But it is good that you can tell me that Stack went to Boeing and was convincing them. I didn’t see anything like that in their records. It looked to me like they built a lot of their design around their TFX.

Whitcomb: Yes. Oh, they did, yes, right. But see, Eddie Paul Edison [phonetic], Joe Alfred [phonetic], and so forth was the one who invented the practical variable sweep by moving the pivot outward, and so it was great for the F-111 and other bombers, because a fighter has to maneuver at high altitudes. It has to cruise, it has to do all kinds of different things, different missions, whereas a transport is a point design. It gets up to a mach, cruise mach number, and flies at cruise mach number until it gets to its designation. Why does it need variable speed? It didn’t. But Stack had that hang-up that it would have a variable sweep.

So anyway, this is the part that--maybe it’s a good point here. I talked to Debbie about this, and she said she was going to work on what you’re working on it. She didn’t, I gather.
Conway: She was going to, and then she got a real job at MIT [Massachusetts Institute of Technology]. She’s the curator of the museum up there. So she’s basically out of it, and that’s how I got the contract. So what happened was, she won the contract, was going to do it, and then when she decided to take that job, the contract came back up for bidding again, and this time I won. In fact, I slept on Debbie’s floor while doing some research up there last month. So she’s fine, and she’s still interested. She has a full-time job and other things now.

Whitcomb: I’ve got to call her up and see how she’s doing. But anyway, I just wanted to point out that I had already mentioned this all to her.

Conway: Yes.

Whitcomb: So then Boeing switched and started working on the delta wing configuration. Since the contract was all signed, there was no way they would ever turn it over to Lockheed. They finally finished it, and about that time, all hell was breaking loose in Washington about people complaining about the fact that the SST was going to ruin the ozone layer in the atmosphere and it was going to make so much noise and all that. Now, they did pass a law that says you can’t fly supersonically over land. I think you’ve heard about that.
Conway: Yes.

Whitcomb: And so these SSTs could not be domestic; they could only go transcontinental. Okay. So anyway, finally Congress cut off money for the airplane. Now, at that point, Boeing already had the airplane pretty well built. There was a lot more work to do. In order to fly it, they had to take it down to Edwards Air Force Base. And this is one of the interesting bits. I don’t know whether you’ve heard this one or not before. But anyway, they took it off from the Boeing field on Sunday so there were very few people around to hear how loud it was as it took off.

Conway: What's this?

Whitcomb: The experimental SST that Boeing had built had to be taken down to Edwards Air Force Base to be flight-tested down there. They were not going to flight-test it over Seattle.

Conway: Well, yes, but what did they build? I thought they hadn’t completed the prototypes.

Whitcomb: Well, wait a minute.

Conway: Of the SST?
Whitcomb: I thought they had completed it. Maybe it was getting ready to be done.

Conway: Yes, they were somewhere around 60 percent complete when the program was canceled in '71.

Whitcomb: You mean to build the first prototype?

Conway: The prototypes, yes. So there might have been some demonstrators before that, that I don’t know about.

Whitcomb: Okay. But anyway, maybe it was just what they planned to do. But anyway, they wouldn’t dare take off on an ordinary day with so many people around, because it made so much noise. I’m sure that there was something involved with the tremendous--they knew that the whole damn airplane was very, very noisy.

Conway: Yes, they did. In fact, in February of '71, they had a meeting up at Boeing about designing a one-third larger engine in order to reduce the noise. But that’s February '71, and, of course, the program ended the next month. So they recognized it enough so that they understood that even at that late date, they were going to have to do a basically complete redesign in order to handle the much bigger engine. They were worried about it.
Whitcomb: Okay. I knew that they were worried about the noise. I think that it was just a story that someone was saying that they had to take it off on a holiday or a Sunday so everybody in Seattle wouldn't be disturbed.

Anyway, so, as I say, Congress just went ahead and cut way back on funding. Then they had second thoughts. You probably heard about this. Well, maybe they made a mistake. So they went back to Boeing and said, “Could you start up working on that airplane again?”

And Boeing said, “We don’t want any more to do with it.” Because of what you just said. They knew the problems.

Conway: They sure did. Then how did the SST stuff continue at Langley? I know why [Richard M.] Nixon wanted it funded, but how did Langley wind up with the job? Is it because Neil was such a partisan in convincing the administration?

Whitcomb: Well, keep in mind that I left the program as soon as I found out what the DOCs were going to be, and went back down to subsonics and developed what is now called the supercritical [unclear].

Conway: That's the next set of my questions.
Whitcomb: Okay, but let me finish up the SST first. So what was happening I’m not sure of, but obviously people like Neil Driver and so forth kept working on various configurations and so forth, although at that point it was not aimed at any particular airplane, because there wasn't another airplane. Of course, about this time or somewhere around that period, I’m sure that you've heard all this by lots of people, the British and French went ahead with the Concorde, and it was a financial disaster of the first order.

Conway: It sure was.

Whitcomb: When they charged people to fly in that thing, they don’t put any part of a development and building cost; it's only paying for the direct cost of fuel and maintenance and stuff like that, crews and so forth. They just threw away the capital cost, and they still lose money.

Conway: It’s amazing that they keep operating. Four billion dollars, roughly, and they created a monster. They're very proud of those monsters.

Whitcomb: Oh, yes, I know. [Laughter] You don’t say anything bad about it to them.
Conway: They’re very proud of it.

Whitcomb: Yes. It’s a good airplane. But what our people came up with before, the direct operating costs were going to be out of sight. Anyway, so, what else should I say? As I said, I had not much to do with the whole program, but then later on I retired. I know that NASA, Langley in particular, went back and started studying the SST again. And keep in mind I was not involved at all, but I talked to people. And finally they canceled the whole deal, and that was just a year or so ago.

Conway: Yes, that’s why I’m doing this now. They’re hoping to learn, I guess, that this really isn’t ever going to work, but it’s difficult because the French don’t give it up either. They keep bringing it back. Aerospatiale has still got devotees, and every year or so they bring it back up that they’re still working on it, and that causes everybody here to worry about it. Maybe they know something we don’t, you know. But I don’t think so.

I might as well ask, how did your SCAT configuration come about? Did you base it essentially around your transonic experience?

Whitcomb: Well, keep in mind the area rule doesn’t just work at transonic speeds; it also works at supersonic speeds. That came a little later in my [unclear]. But then also I tried to integrate
designs. I'd come up with a number of different concepts that I put into that transport. For example, blended engines built into the airplane. Years ago, back even before the supercritical wings, but it was after the area rule, I came up with the idea of localized area rules. When you're right at the speed of sound, the area rule works the ideal way, which you can just indent the fuselage and so forth. But at lower mach numbers, the shockwaves haven't spread as much, so I worked out a local area role where and I put a series of bodies--they were called antishock bodies--along the upper surface. The Convair people put them on the 990.

Conway: Okay. So that's what that is. I know the odd appearance.

Whitcomb: It was essentially area rule, but it was making the combined shape of the upper surface of the wing into airflow shape that was much like what I came up with finally for the supercritical wing. It was related to it, but it was based on area rule and not finally changing the whole damn airfoil shape, with I did on the supercritical wings.

Okay. I want to clear up most of the stuff on the SST before I get into the supercritical wing, because the supercritical wing very definitely impacted on what happened to the SST.

Conway: Okay. That's interesting.
Also the wing, but more importantly the supercritical wing. Now, the supercritical wing allows for a given thickness ratio, and that is the thickness of the airflow compared to the core, the lower you can make that, the higher speed you can go to and the higher subsonic speed you can go to. That we knew long before the supercritical wing. On the other hand, it makes the structure less efficient because it doesn’t have enough beef in that little thin airfoil. So with the supercritical wing, you can make it much thicker.

I originally--let’s put it this way. Originally I designed the damn airfoil so that airplanes could go faster. Traditionally, that’s what airplanes sold, was speed. So most airplanes were flying about 80 percent of the speed of sound. Boeing got up to 83 percent with the supersonic. But with the supercritical wing, I finally ultimately, after I’d worked out that we had the area rule, and we had the supercritical wing coming along, and we flight-tested that. The way that we flight-tested was the one I was going to do. And I designed a transport configuration which flew at 99 percent of the speed of sound. I wanted to get at Mach 1 and call it a sonic transport. Remember, I was against supersonic transports. And so I said, “We can get
up damn much, much faster but it will be just as efficient as present airplanes and it will be faster.”

Now, that was great. Boeing was actually laying out an airplane, I mean a real airplane, based on that design. And then the damn Arabs quadrupled the price of fuel. That was ’72 or something like that.

Conway: ’73, yes.

Whitcomb: And anyway, suddenly the airlines said, “We don’t want to fly any faster. We want to have more efficiency.”

Okay. I says, “All right, we’ll use the supercritical wing technology and make it a more efficient wing.” And there what you do, you use that new technology to allow you to make the wing thicker, because [unclear] adverse effects and therefore allows you to go to a thicker wing, because as you go to a thicker wing, it makes it worse, but if you use a supercritical thick wing, then you get back to what you had for a conventional airfoil. And the other thing that [unclear] does is to allow you to go at a much greater span. I’ve always had a hard time explaining this particularly to reporters and so forth, but if you make something--I used to have a prop on this. I’ll make a prop. [Tape recorder turned off.]
Okay, let’s see. We were talking about wingtips and Boeing’s dislike of the idea of actually improving its older aircraft. Let’s see. I think I’m out of wingtip questions, so let me go back to the area rule. I had a couple of specific questions on the F-102 program. How did NASA go about transmitting to Convair the area rule and how did Convair receive it?

It’s a very, very interesting story. Now, keep in mind there was no--in the first place, Convair was not singled out. We told them about the area rule. When I first came up with the data, of course, the administrator of NACA came down to see me. It was NACA at that time. Anyway, showed them all the data, and so everybody, of course, was very impressed. The industry didn’t know anything about it. At this particular point it’s very highly classified. This is going to be used on military airplanes and make our airplanes a hell of a lot better than Russian airplanes.

And so what they did, they didn’t even want to send out a secret report. They sent out letters to all the companies manufacturing military airplanes and said that there was something very interesting at Langley and you have to send some of your top engineers to come and hear about it, because they didn’t want to send anything through the mail.

They didn’t want anything on paper.
Whitcomb: And, of course, Convair was with them. But that’s only half the story with regard to Convair. Convair, we were right in the middle of the Century Series fighters at that point, which I’ve already talked to you about the fact that everybody thought they could build supersonic airplanes for various missions. Convair 102 was an interceptor and the 105 was a fighter-bomber and the B-58 was a bomber, and the Navy had a big F-111, which was a carrier-based airplane. And so there were different types of airplanes in that Century Series of airplanes.

I want to get to the next step. Anyway, everybody came in. The other thing I was going to bring up, because at this particular point we were deeply involved with the whole Century Series fighter thing, the one reason I had gotten into this was because the damn drag was so high. So we had provided to Convair the drag data for the airplane, the F-102, the way it was designed, and the drag was going to be out of sight. I mean, all we had to do was tell them, "You’re not going to go through the speed of sound with that drag." And of course, nothing new. Convair was not the only one. "There’s something wrong with your wind tunnel data." Okay. They kept going and they built the airplane, and it did not go through the speed of sound. The 102 is the famous case because it has a before and an after. All the rest of them, they changed the design before they built the first one.
So anyway, they were hedging. The engineers were hedging, not the managers. So the engineers, I worked with the engineers. The chief of [unclear] and everybody else was in my office, and we discussed how we were going to modify the airplane to improve it on the basis of the area rule. And of course, you can’t. You’re not going to start over from scratch. That’s too far gone. But they could indent the fuselage, not as much as it should have been, but quite a bit, because they had to move things around, you know.

And so they had the design all ready and they were actually building the model parts for it. The engineers believed me. I’m sure the management did, too, but they refused to change. Anyway, they got the data and everybody saw it and it was going to solve their problems, but then management said, "No. Why not accept the airplane the way it is, as a subsonic airplane." That was a total absurdity. And the program manager at Wright Field said, “Either you change that fuselage or the contract is canceled.” That got their attention. [Laughter]

Conway: I imagine.

Whitcomb: So you asked about the area rule and Convair, and you just got that story.
Conway: I think you kind of answered my next question, which was, How involved in the design changes were you? You said you and they were working together to figure out the idea with the tail bunks [phonetic], is that right?

Whitcomb: It was more than tail bunks, because the fuselage was indented. It was squeezed in. Have you ever seen pictures of it?

Conway: Yes. How involved were you with helping to make the changes? Yes, I've got lots of pictures. This book talks about the F-102, and so does Richard Halyon’s [phonetic] book on Dryden history. So they go into detail. I’m trying to find out how the interaction went between you and Convair.

Whitcomb: As I say, we talked. However, I can only tell them what to do aerodynamically. They’ve got to figure what they’re going to do to put the airplane together. I mean, I can’t tell them--I could tell them, "Ideally you should have did it this way." They said, "We can’t go that far. Put as much in as you can." It’s a give and take, because they have to--they saved most of the airplane, the whole front end and all kinds of structural. The wing was the same.

But there was one other thing. You said something about the bunks in the back end. Remember, I told you about the program manager who told them the contract was canceled unless they
changed. But he was a good aerodynamicist, too, so he came up with the ideas of the little bunks on the sides that extend the area distribution. But that was only an add-on. Some people thought that was the only thing that changed. You’ve got to see that the fuselage is now indented like a Coke bottle.

**Conway:** It’s more indented than the F-106.

**Whitcomb:** Oh, yes, much more so. But they started from scratch on that one.

**Conway:** Right. That’s good to know.

**Whitcomb:** Oh, I forgot one thing. This is a little side story that has nothing to do with technology. It has to do with--remember, they’d all been told that they’ve got to redesign and they’re well along in the design process, but then they started building a new fuselage. And while they were at that, I was invited out to see what was going on.

I have never seen anything quite like it. They had at least thirty or forty people working on that damn fuselage. They were swarming over it. They had platforms. You’ve seen platforms along the sides of buildings when they're working on the whole building. They had platforms at various levels, with all those engineers, all those technicians, riveters, and so forth working
on that fuselage because they had to get it built just as fast as they could. As I say, not any engineering achievement; it’s just fascinating.

Conway: Interesting. Let’s see. I had more questions. The only one considering continuing with the supersonic business jet partisans, but I think you are already on record as thinking that supersonic transports are never going to work out.

Whitcomb: Now you said something about supersonics--

Conway: Business jets, yes.

Whitcomb: I haven’t talked to you about that yet. You want me to make my speech on that?

Conway: Sure. Debbie related it to me, which is pretty funny. So we might as well get it on the record.

Whitcomb: Okay. Well, I’ve already told you the problems with the SST.

Conway: Right.
Whitcomb: But now multiply that by a factor of ten and you’ve got the damn problems with the supersonic business jet. You know, I have dealt with many Air Force generals, and, boy, are they arrogant. But anyway, they make a command, and that better be carried out. And so this Air Force general retired, and he was the one who set up the business of making the supersonic business jet. And I heard about that. Well, the guy came to me, poor aeronautical engineer comes to me, and told me what the guy wanted. He said, “He wants a supersonic business jet.” And I hit the ceiling and I laid into the poor guy. And it wasn’t his fault; he was hired to do a job.

But keep in mind, the Concorde is a good starting point. That’s a fairly small airplane, so American airplanes wouldn’t have this problem, but it’s 100 passengers or so. But they only had, I think it’s one aisle of single seats on the sides. It’s very, very narrow. That’s the key I’m leading up to, because that’s the way you get the drag of the fuselage down, supersonic drag. And it’s kind of squeezed, as I understand, but you’re not in the airplane very long, so it’s not—but let’s go to an airplane that’s one-tenth the size. Now you’ve still got to have a long, slender fuselage, and when you reduce the damn size, to get in it, you’d have to crawl down the aisle. I mean, crawl, like in a tunnel. And then sit and lean back.

Conway: Because you’re not going to be able to stand up.
Whitcomb: You can’t stand up, not anywhere near stand up. Most business jets, subsonic business jets, just won’t clear a six-footer. Six-footers have to duck.

Conway: Duck to get in.

Whitcomb: But here’s a case where you’re going to be half that. I mean, you’d have to crawl in, not stand.

Conway: It's come back again. This idea just won’t die. So when was this particular group that you were talking to active?

Whitcomb: Oh, god, that was way, way back, you know, when we were working on the supersonic transport. And this guy wants to go to a supersonic business jet. And the other half of the damn problem is, you can’t fly over land, an a business jet will never have enough range to fly across the Atlantic.

Conway: In one stop. Or without a stop.

Whitcomb: That’s right. So what’s it good for? If you stop, then you're back to competing with subsonic airplanes.
Conway: Then you might as well keep the long-range Gulf Stream 5s or something.

Whitcomb: Right.

Conway: Okay. Well, that’s great. I think that I’ve covered all my questions. We’ve talked about Neil Driver and the driving force of the SST stuff. You had talked to Walter Bonne [phonetic] in a previous interview about a supersonic transport was going to be inefficient no matter what we did. I think we’ve beaten that to death. And we’ve talked about wingtips and computers. Is there anything you can think of that I haven’t asked that you think it’s important to mention?

Whitcomb: Well, I threw a few of those things in there along the way. But, let’s see, anything else? As I already emphasized strongly, the whole problem of supersonic--I might mention something else. The B-58 was supposed to be a supersonic cruise bomber.

Conway: Right. I’m glad you brought that up.

Whitcomb: And we got its drag down so it could go through the speed of sound, and it was a pretty good airplane, except because it was supersonic, its range--well, it was a pretty small
airplane, too—it didn’t have the range the Air Force wanted, so it got scrapped fairly early in the game, even though B-52s, which are old, old subsonic airplanes, are still flying, because it’s got the range.

Conway: Yes, and the cargo capacity. There aren’t a lot of things they can carry as much pounds as the B-52 can in terms of bombs.

Whitcomb: Right.

Conway: When the Air Force started working in the XB-70, was there a lot of Langley involvement?

Whitcomb: Oh, yes, quite a bit of involvement, but that was before—the supersonic airplane, after—mostly the things I’ve been talking about were long gone, but they wanted a supersonic cruise bomber like that, which was bigger and would probably have more range than the B-58. [unclear] B-70. And there was things that were built into that airplane which NASA developed, like the wing was going to fly in a positive pressure field on the engines to get a favorable interference there, so there was some advanced aerodynamics there.

But the big problem was, as you probably know, it died a horrible death when some—I think it was for Life magazine, they
wanted a fighter airplane flying near its wingtip, and the damn vortex off the bomber flipped over the fighter and the fighter ran into the bomber and they both went down.

Conway: Yes, I’ve got pictures of that. I’ve never seen it mentioned that the vortex caused the collision, though. That’s interesting. I’m not surprised, I suppose. It’s almost a 500,000-pound bomber.

I know about the compression lift idea coming out of NASA. I was wondering how much wind tunnel work on NASA’s part went into the XB-70 and how much other effort was involved with it. Both the B-58 and the XB-70 are important to what I’m writing, because to me they suggest to the pundits that a supersonic transport is possible, because the way the B-58 especially was reported to the press was that it was an intercontinental range supersonic bomber, which implies it was supersonic the whole way, which, of course, it couldn’t have been.

Whitcomb: No, it wasn’t.

Conway: But I think a lot of the supporters of this didn’t know that. So I’m very curious. I’m digging into those two programs as much as I can.
Whitcomb: Many airplanes were designed to get--most of their legs are arranged subsonically and then penetrate enemy territory at supersonic rate, like the B-1 and other airplanes, B-2. That’s the only way to get the range.

Conway: Yes. It seems to me that by 1960 or ’61, there’s at least you and some other minority of people who think that supersonic cruise aircraft are never going to be able to achieve the kind of range that the subsonic aircraft could, and that there is this division then between you and your side of Langley and the Neil Driver crowd who still are convinced of that. I find it interesting that that split continues, because there are still people that support it and there are still people like you that oppose it. It’s going to be interesting to try to explain the story, the continuation of the belief in the supersonic transport.

Whitcomb: Well, the key part that I hope you get into your story is that while the guys on the supersonic transport were definitely making improvements, we were making improvements in the subsonic airplanes also. They have a moving target.

Conway: Yes, yes, I certainly will. In fact, my first chapter is actually on the subsonic jet revolution, so I talk about the 707 and the DC-8. I get into supersonics in the second chapter. Throughout the book I keep bringing back in the latest changes in
the subsonic aircraft in order to set up the idea of a moving target both in terms of efficiency and in noise reduction, because it’s clear to me that one of the major causes is the continued inability to make economical SSTs, that the noise standards keep going up, and while it looks like they might have had a design in ’75 that would have been competitive with ’75 subsonic aircraft, they used that design as their basis in 1990 when a new set of noise standards were in effect, and the noise standards kicked their butts, essentially, and made the plane a million-pound airplane, and you can’t get away with that for a 270-passenger vehicle. Yes, I absolutely want to bring up that interrelationship. It’s a complex history, but it’s [unclear].

Well, I’m out of questions. If you’ve got something else you’d like to bring up, go right ahead, but I don’t have anything else to ask.

**Whitcomb:** Do you have to get back?

**Conway:** No, I don’t have to be anywhere. I’m just out of questions, that’s all. I might have more once I’ve reviewed the transcript of this, but that will be a couple months down the road. It takes a while to get this stuff through the transcription ring.

**Whitcomb:** No, I can’t think of anything.
Conway: Okay. I'll shut my machine off here.

[End of interview]