

SHUTTLE CARRIER AIRCRAFT ORAL HISTORY PROJECT

EDITED ORAL HISTORY TRANSCRIPT

LARRY LAROSE
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is April 12, 2012. This interview with Larry LaRose is being conducted for the Shuttle Carrier Aircraft [SCA] Oral History Project at the Kennedy Space Center. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright and Sandra Johnson. Thanks again for taking time out of your day to meet with us and giving us that great tour of the SCA.

LAROSE: I'm glad to do it.

ROSS-NAZZAL: We appreciate it. Give us a brief history of your career at NASA.

LAROSE: I started with NASA in 1979, come onboard around September, and I started on the Zero-G [gravity] program on the KC-135 [aircraft] as a flight engineer. Then shortly thereafter, about December of that year, I was selected to go to the STA Program, the Shuttle Training Aircraft, and I stayed with that program until I retired in 2008.

In 1989, I was selected to transfer from Johnson Space Center to El Paso, Texas [Biggs Army Airfield], to assume the responsibility of the El Paso FOL [forward operating location] manager. What we had out there was the STAs flying, and we also had T-38 [aircraft] depot maintenance. We started out with 5 contractors and 1 civil servant, and I think we had 42 contractors and 2 civil servants by the time I left in 2008.

That's a little bit in a capsule where I was at and what I did. And all the time I still maintained my currency as a flight engineer, but then I took the role on as being a manager. I certainly liked the role of being a flight engineer. I like flying a lot more than I do managing.

ROSS-NAZZAL: Tell us about the role of the flight engineer on the SCA.

LAROSE: That is a field that I love dearly, because that was what I trained to in the Air Force as a panel engineer on [Lockheed] C-141s [Starlifters]. When I first come to work for NASA on the KC-135 and the [Grumman] Gulfstream II, that really wasn't a panel engineer position. They called it a flight engineer, but it didn't really have a panel. When I got selected to do it for the [modified Boeing] 747 [SCA] in 1989, it was like going back to my old roots. It was fun to be part of that program, and it's still a real pleasure to be doing that type of work. That's how I got selected.

ROSS-NAZZAL: Tell us about your responsibilities for the plane.

LAROSE: We go out, pre-flight two hours prior to the mission, and walk around the airplane and make sure that all the cowlings and the doors and everything is closed up, and make sure that we don't see any maintenance that hasn't been closed out that will be closed out before flight. If it's not working, then we'll go back and make sure that it does get closed out properly.

That's on our walk-around outside, then we basically do the same thing inside. We do a walk-around just like you saw down there on the lower deck. We'll make sure that no loose materials are floating around when we get ready to take off. We want to make sure everything is

attached, like on a passenger [airline] you get your seatbelts on. We have to tie it down because we don't want anything moving around when we're taxiing or taking off.

Then we go up in the cockpit, and we check all the systems and make sure that before the pilots arrive the radios and the flight controls and the systems are up and running prior to takeoff. Again, we don't want to wait until we go for the first time and power things up. For example, coming out of Edwards [Air Force Base, California] we had a fuel boost pump failure. Fortunately for us, our MEL [minimum equipment list] allows us to take off with a failed boost pump, but it allowed us to make a decision 2 hours prior versus 15 minutes before we start engines. Sometimes if you delay that, then you don't have any time to recover and save a mission. That's why we do the pre-flights.

Then it comes times to start the engines, and we start running checklists. The FE [flight engineer] runs a checklist, and we assist the other crewmembers on getting the engines started and getting all the systems up and running. From that point on we call the taxi checklist and the before-takeoff checklist, and just kind of be a third set of eyes and do our duties as assigned.

ROSS-NAZZAL: When we were up in the cockpit there's room for three people, but you have two flight engineers. Tell us about how that's different from a normal crew.

LAROSE: Well, it gives us some capability that if we get into an emergency situation we have another set of eyes. It allows that engineer to go downstairs and fight a fire, emergency, or whatever else. Remember, we're not carrying maintenance or anybody else with us, so we need somebody to be mobile to go down and do what we need to do downstairs and look at the condition of the orbiter.

I told you earlier how much I can see—it's not a whole lot. There's not a whole lot I can do even if I did see something, because there's no way I can get out. We just have to land and figure out what our problem is and also help when we have to. If we lose an engine on takeoff, to help dump fuel to lighten our load so we can get down on the ground or continue to fly. Being so heavy, if we lose an engine it's a handful to keep it in flight with the weight that we are. We're trying to reduce the weight as much as possible and maintain flight.

ROSS-NAZZAL: Have you ever lost an engine in flight?

LAROSE: I've never on my watch. They did at Edwards. I think it was 1996, I have to go back and look at the archives. The crew had just lifted off from [runway] 04 Edwards, and I think it was the number three engine that caught on fire, and they basically just teardropped back to runway 22. It was just fortunate for them they were all cleaned up and engines were at full power and flaps were up and the gear was up, so they didn't have a lot of drag out there. If you're going to have an engine fire—nobody wants one, but if you're going to get one that would be the best time to have it.

They basically started dumping fuel and dumped what they could until landing, and [it was] pretty uneventful. The engine fire light stayed on even through taxi roll, but everybody got home safely and the orbiter was safe. We didn't do any serious damage, other than we had to change an engine before we went to go fly.

ROSS-NAZZAL: How long of a runway does the SCA need to take off?

LAROSE: Very long. We like to look at Air Force bases 13- to 15,000-foot of runway. This, KSC, is 15,000. Edwards is 15. But most SAC [Strategic Air Command] bases are anywhere from 12 to 14 to 15,000 feet of runway. We need a fairly long runway because of takeoff roll. It depends on temperature and conditions, but Tuesday's flight [ferrying *Discovery* to the Smithsonian National Air and Space Museum in Chantilly, Virginia] will probably be 9,500 to 10,000 foot of runway takeoff for a ground roll. I've had ground rolls sometimes 11, 11.5. It takes a lot of runway because it takes a long time to get a lot of speed because you're so heavy. That's why we pick Air Force bases, because they have long runways.

ROSS-NAZZAL: By comparison, how much runway does a Continental [Airlines, Inc.] or a Southwest [Airlines Co.] flight need?

LAROSE: They're typically anywhere from 10 to 12,000 foot of runway. At El Paso there's one runway that's 9,000 feet, and they don't need that much. They'll lift off at 4,500 to 5,000 feet. Again, it all depends on weight. The lighter they are, the shorter the runway they are. When we're not carrying the orbiter, we lift off at 2,500, 3,000 feet down the runway. We've got a lot of power but not a lot of weight, so we just jump off the ground. It's all depending on the temperature of the outside and the weight of the vehicle, what our performance is.

ROSS-NAZZAL: About how long does it take you to get off the ground when you've got an orbiter attached?

LAROSE: Well, it seems like it's forever, especially when you push the power up. You just lumber down the runway. As you pick up speed and get to that magical number of rotate speed, you look at the other end and say, "I'm glad it got to that speed," because now you're running out of runway. Like I said, 11,000 foot of runway.

On this situation we've got 15,000 foot of runway. We've still got 4,000 foot remaining, but there's been some runways, like 12,000 foot at Barksdale [Air Force Base, Louisiana], that when we have those long rolls, we use almost—not every bit of it, not to a danger point where we know that we're not going to get rotate speed and safely lift off, but there's not a lot of runway to play with.

ROSS-NAZZAL: You mentioned in the note that you sent me that one of your biggest challenges is engine power. Would you talk about that?

LAROSE: What I mean by that, and this is just me—one of the critical phases of flight is power with this airplane. If you lose any power it's detrimental to flying. So I think that's a critical phase, especially on takeoff. If you lose an engine, it's a handful to get it in the air. There's a lot of things happening, and it's that crew coordination to make it work.

We train to do that in the simulator. We have three engine B-1 cuts, and we train to lose an engine and safely get it off the ground. We demonstrate it in the simulator, but nobody really wants to have that happen. In my mind, that's the critical phase of flight, I don't want to lose an engine. Nobody does—that's the one thing that we don't want to happen.

ROSS-NAZZAL: What kind of engines do you have on the SCA?

LAROSE: We have JT-9J engines. They produce approximately 49,000 pounds, almost 50,000 pounds of thrust, so we've got over 200,000 pounds of thrust on takeoff for the 747-100s. The original ones were 7-As, and they produced about 47,000 pounds. We upgraded them to the 7-Js, which gives us an additional 12,000 pounds of thrust combining all four engines. You can never have too much power, that's how I look at it. If you can give me more power, that's what I need as an engineer. The more power the better.

ROSS-NAZZAL: Tell us about crew training. You mentioned that you train in the simulator, and you also take the plane out.

LAROSE: Yes. I was intimately involved in training because I set up for crews to go to training centers. When we lost a contract at Pan Am [Pan American World Airways] in Miami [Florida], we went out looking for another training site. We run upon a training site up at Denver [Colorado] at United Airlines [Inc.], so I had a chance to meet with the very talented crew up there that was willing to take us on and provide us a good service. They provided it until the time that United retired their sim [simulator], and we're still now using the United sim. A great bunch of people up at the Denver site.

We had been training up there—I think we started there in the mid '90s, '95 timeframe. [Arthur C.] "Ace" [Beall], myself, and Bob [Robert] Zimmerman were the last crew that went through there for SCA training. I think it was the third week in March. So that will be it for them as far as SCA crew. We're still using that simulator for SOFIA [Stratospheric Observatory for Infrared Astronomy], but it will be the last time we use it for Shuttle carrier training.

Our requirements were we had to do two sims a year, where a normal cargo or commercials only have to do one sim a year. Because we flew it so infrequently, that's the reason why our standard operation procedures tell us we had to go twice a year. That meant usually four days, two days of ground and two days of sim. The ground was to talk about systems and malfunctions and abnormals. Then we actually get in the simulator, and they give us the sims.

We also had the capability of having software that we could simulate the Shuttle on top of the 747 to give us that drag, to give us that feel of what it would be with the orbiter on top if we lost an engine or we had a malfunction or hydraulic problem. So we had that capability to really have a true simulator of what it would be with an orbiter on top.

ROSS-NAZZAL: That's interesting. So you had people who were experts in 747s but not SCAs.

LAROSE: Oh, yes. When I say "experts," they had a lot of expertise in the 747 performance of the simulator. They provided us a lot of information, but we also had to provide them the information for our unique flying too. It was a good tradeoff for both organizations. We were very lucky to tag on with the folks up at United Airlines.

ROSS-NAZZAL: When you do that kind of training, are you normally training with the pilots that you would fly with? This last time you mentioned you flew with Ace and Bob Zimmerman. Would you normally fly as a group when you were on the SCA, or would you fly with some other people?

LAROSE: It just depends on the rotation and the selection. On the first flight [to Washington, D.C.] I'm going to fly with Bill [William E.] Rieke and Jeff [Jeffrey L.] Moultrie, but that was just a matter of a draw. It could have been with Jeff and Bill when they were up doing the simulator. It just depends on schedules. They wanted to go early because they had a lot of preplanning to do, and since they were running it Jeff, Henry [T. Taylor], and Bill got the first selection, and then we got what was left over. That's just the way it happened. We all trained. The syllabus is the same; we don't do anything different as far as crews. When it comes to crew selection, it very well could have been Ace and Bob, or Bill or Frank [W.] Batteas. It just depended on how the crew selection was made to go fly.

ROSS-NAZZAL: Tell us about that crew selection. How was that made?

LAROSE: Back when we were ferrying on a regular basis, it used to be that if I flew last then I'd be the last in the rotation, first out, last in. Especially when we were having to deal with launches. A lot of us were multi-qualified in different programs. If I was tasked to be on a launch and there was a ferry mission, then probably I was not going to be in the rotation. Or somebody would have to replace me in the STA, and then I'd have to go fly the SCA. A lot of it was crew availability, if you weren't on another project or the rotation. If I flew the last leg on the last ferry mission, then I'm going to be the last one in the rotation on the next one. There was six pilots and four flight engineers at that time, so we had that complement to rotate from.

ROSS-NAZZAL: You mentioned that you actually got to put in requests for certain ferry flights. Would you talk about some of the flights that you put in requests for?

LAROSE: One of the ones that I really wanted to be involved with was the ferry mission of the *Columbia* back to Palmdale [California], but we went through Salt Lake [City, Utah]. The reason for that was I'm originally from Wyoming, and my folks still live in Wyoming. My wife's family lives there also, but a lot of her family lives in Salt Lake. So it was an opportunity to be able to take the Shuttle up into the Rocky Mountains and up west, because they don't experience launches. They don't know what an orbiter is. They see it on TV, and it was special.

We had a lot of problems getting out of here because of delays, and then we had some instrument problems shortly after takeoff. We were working those issues, and the tower come back and said we hit a bird. We didn't know where, and we didn't feel it. I was asked to go back and look and see if I could see anything on the orbiter, and I couldn't see any damages. When we landed at [Naval Air Station Joint Reserve Base] Fort Worth [Texas], we ended up taking some damage on the left wing leading edge and took out some tiles, so they had to do a repair before we could take off.

That was a delay, so we thought we might not be getting to go to Salt Lake that night. Well, they got it fixed fairly quickly. They were starting up the Pathfinder, and they had some engine start problems, so now we're going to have to find another jet to be our Pathfinder. The word went out and there was a lot of anticipation, a lot of anxious moments in Utah that they really wanted that vehicle up there. I think there was some telephone calls to the Utah Air National Guard, and they had happened to have a KC-135 in the air so they diverted them down to be our Pathfinder to Fort Worth. They got a briefing from the pilots of what this required, and we also had one of our pilots with them so they knew where they had to be at in the reporting back to us for the Pathfinder.

It come time to go fly, but we were getting late in the day and one of the requirements in the ferry missions is that all our operations has to be day VFR [visual flight rules]. We don't want to fly at night. We want to be able to see out there. We want to see clouds and we want to be able to see other traffic, so we have a mission rule that we have to be in day VFR. We can go up to the sun's starting to go down, half hour after the sun, but we really don't want to do that. Then you would have to get a waiver.

As we got a little closer in to Utah, I remember coming over the mountains of the Wasatch [Range] and dropping over Spanish Fork [Utah]. I'm familiar with that area, so I know where we're at when we're dropping in. We dropped in over Spanish Fork and then up through Provo [Utah], and then we were kind of tracking on I-15 and just going around Thanksgiving Point [Lehi, Utah] and then up through Sandy [City, Utah] and Salt Lake. It was very interesting because the sun was going down, and you could actually see people on their roofs flashing flashbulbs at us as we're going up. I'm not sure what the pictures looked like.

Also what was interesting was seeing people pulling off the side of the road on I-15. I could also see the Highway Patrol trying to get them to move, but they weren't moving. We're watching all this going on as we're making our turn back up towards Ogden [Utah]. Same thing as we were going through Salt Lake. Off to our left, we could see the [Salt Lake City] International Airport, and you could just see it flashing because there was lots of folks there waiting on the ground for us to land. Two of those folks were my parents. But we flew past it. We flew up to Ogden and flew over Hill Air Force Base and then hooked it back toward Salt Lake. It was quite the arrival. It was fun.

ROSS-NAZZAL: You guys were celebrities that day I suppose. Lots of media interest as well?

LAROSE: Oh, very much. I got a chance to give a tour to my wife's family and to my folks, and while I was doing that my mother was tugging at me. She says, "You have somebody that's along with the tour." I did not know that somebody had joined us. Well, it was Senator [Edwin Jacob] "Jake" Garn. So my mother, "Well, he needs to come up here." I said, "No, this tour's for you. If he wants to follow along, that's fine." She was nervous the whole time, and I said, "Mom, it's okay." That was kind of funny.

The next morning—and this was another one of these things that you don't think about until it approaches you—we were about an hour from takeoff, and I got this special request. I'm not even sure who it was from the airport side, but they said, "We have this elderly lady that would like to go aboard the 747," and could we do that. The last time she had visited the airport was to come see Charles [A.] Lindbergh in the late '20s. How can you refuse something like that?

She was in a wheelchair, so I said, "Sure, we can. We'll figure out some way to get her aboard the airplane." We got her aboard the airplane and talked a little bit about what we did. She was very appreciative, and she told me as a little girl the last time she was at the airport was to come to see Charles Lindbergh. This was just as proud a moment for her as it was for us.

ROSS-NAZZAL: Neat history. You've flown some other historic flights, one of which was a simultaneous ferry of *Columbia* and *Atlantis*. Would you tell us about that?

LAROSE: Well, it wasn't much different from any other ferry mission. They had us at different sites. One took off from Palmdale, and I was the one that went out of Edwards, on the *Atlantis*.

I think our first refuel spot was at Wichita Falls, Texas [Sheppard Air Force Base], and I think the other one went to Dyess [Air Force Base], Abilene [Texas], so we had them in different locations. There was some concern that they did not want to have both orbiters in the same location for safety. They didn't want to be able to destroy two orbiters at the same time, so if they kept them separate they wouldn't run that risk.

It took a lot of resources, and all of the crew members got involved with that because we needed all of them. There was two engineers on each airplane and then we had the additional six pilots, two on the airplane and one on each of the ferry aircraft. We used the entire crew complement on it, so there was no rotation. Everybody got a leg on it. That was the fun part. One of the things I remember is when we got here everything was uneventful. I think I was on the crew that landed first, and we unloaded. Henry, I think, had to go home, so I ended up getting to jump over to the skid strip to do the short flight from here to SLF [Shuttle Landing Facility], or X-ray 60 as we call it, for the unloading.

You have to go back in the archives, but you can see it was really blowing that day. We had a lot of crosswind. You can go back and look at the *Florida Today*, and it was one of these things that looked like it was a near disaster. The right wing tipped down and we almost struck a pod. It wasn't that bad, but the picture looked like it was pretty bad so there was a lot of wringing of hands and saying, "How close was it?" Yes, we had a lot of crosswind, but we got down safely. It was blowing pretty good out there at that time. You have to go back and look at the picture; it looked pretty bad.

ROSS-NAZZAL: Were you involved with the Phantom Ray flight?

LAROSE: No, I was not. I did the security checks, and it looked like I was going to be part of the crew, but when they decided they were only going to do one leg that eliminated me. They didn't need a third FE to do a crew swap wherever they were going to stop at, so no, I wasn't involved. I was helping for the training up to that point, but when it came time to fly the mission, no, I didn't do it.

ROSS-NAZZAL: In August there was actually a formation of the SCAs flying together out at Edwards, which seems to be very unusual.

LAROSE: Especially that big of an airplane. It was quite a moment, I'd never experienced something like that before. I've been part of formation flights, but nothing like that. Two 747s, I mean, that's pretty unique. I was flying on [SCA] 911, so I got a chance to see Jeff in [SCA] 905 come up from behind us and to our left wing. To see such a big piece of metal coming towards you, it got your attention. It was fun to watch that and be part of that. From the videos I got to see from the F-18s [aircraft] and some of the ground shots, it was a pretty good photo op [opportunity].

ROSS-NAZZAL: Was there any discussion about where you would fly and how you would fly?

LAROSE: Yes. We had a pre-brief before we went to go fly, and basically Jeff choreographed what we needed to do with both sets of airplanes and what he was planning on doing and how long we were going to be up. We also had to have the F-18 be part of that briefing, because when we've got three ships up there you want everybody to be on the same page of music.

ROSS-NAZZAL: How long did you fly in formation?

LAROSE: Probably 30 minutes, I don't remember. We couldn't spend up very long, because 905 was very limited on aircraft time that it could fly because it was on a check flight and they were doing some engine monitoring stuff. They were very limited on their flight time, so it wasn't very long.

ROSS-NAZZAL: Tell us, if you would, about your role as flight engineer in the flight readiness review [FRR].

LAROSE: Because I'm living in Las Cruces [New Mexico], I don't get involved with the flight readiness review. Back in the early days, yes, there was a couple things that I would provide, but it really was a pilot brief. They really wanted information from the FEs about who the crews were going to be in selection and performance. They needed to know if we could use the fields that were picked from the Department of Defense [DoD].

We had some DoD representatives at JSC that would go out and review these fields that were available to us for landing sites. Then what we'd also have to do is find out if we could use them. I was telling you about our performance. We'd look at runway length and that particular time of the season and the temperatures and see, with the weight of what we had, if we could use those runways.

We would provide that information for the FRR and say, "Okay, if we got in there at sunset or close to sunset, then we'd have to spend the night due to temperatures," or vice versa.

The fuel load that we could put on to get us to our next destination, or we could put enough fuel if we spent the night to go past another destination and go a little further. Those discussions were made on the FRR in our range and in our capability. But again, I've been retired so I don't have to do that stuff anymore. I just come fly, which is a good thing.

ROSS-NAZZAL: Can you give us a sense perhaps of how ferrying has changed over the years since you've started?

LAROSE: I don't think it's changed. I mean, this [ferry] is going to be a little bit different because it's what is classified as not a live orbiter, so we don't have the hypergolic fuels, and we don't have to supply the power for the minus-10 restriction. So this will be different from what we have normally have seen in the past, but over all the 20 years of ferrying I haven't seen much of a change. It was the same as it was when they started back in the early '80s, at least from my vantage.

ROSS-NAZZAL: Tell us about the fact that you're working out in El Paso. Most of the people who flew or were flight engineers were based out of JSC, but then I understand you also had a pilot or two at [NASA] Dryden [Flight Research Center, Edwards, California]. Tell us about how all of that worked.

LAROSE: When I lived in El Paso I still belonged to Johnson Space Center. That was a JSC facility, just like White Sands Test Facility [Las Cruces, New Mexico] is still part of Johnson

Space Center. We had a crew that had flight engineers and pilots at Dryden, but in the '80s we eliminated the engineers and just went with the pilots.

The reasoning for that was that if for some reason we needed to move the airplane and the JSC pilots—it takes them a day to sometimes a day and a half to get there, depending on T-38s or if we had a commercial [flight]. But we still had to provide an engineer, so it still was a day for me to get out there from El Paso. It give us flexibility that if it needed to be moved or we needed to position it somewhere, we had a crew that was there to make that happen.

ROSS-NAZZAL: So you would fly from El Paso out to Dryden?

LAROSE: I fly to L.A. [Los Angeles, California] and then have to get in the L.A. traffic, and sometimes that was longer than the flight from El Paso to L.A. I can't tell you how many times I've been stuck in traffic in L.A. for two or three hours just trying to get across the mountain, painful.

ROSS-NAZZAL: Tell us a little bit about the plane. The plane is kept at Dryden, but it's JSC property, so one of the questions one of the Dryden historians asked me is are people possessive of that plane? Do people at Dryden think it's their plane, people at JSC say it's their plane?

LAROSE: The best way I can explain it is it's part of Shuttle operations, and Shuttle operations is JSC flight operations. That airplane was in direct support of the orbiter. That's why it had a 9 serial number, versus an 8 from Dryden. That's the reason why it belonged to JSC.

The other thing is it was a great place to maintain an airplane because it was a high desert, not a lot of humidity and corrosion. That's a big enemy, especially for airplanes like that. That's one of the reasons why we used to have the Guppy at Houston, and now the Guppy is in El Paso because of the desert and the low humidity. You really want to do that, so that played into it too. Plus that's where we landed, so that's another reason why the 747 is at Edwards, because if we're going to land we might as well have it in position ready to go.

ROSS-NAZZAL: You mentioned for a time 911 was out in El Paso. Would you talk about that?

LAROSE: It showed up at our doorstep in 1990, and we deconfigured it. What I mean by deconfigured it, we took all the passenger seats out and the luggage racks and the galleys and lavatories and reduced the weight, did a little bit of the work before it got to the Wichita, Kansas, Boeing facilities for modification.

It was originally assigned to El Paso because it was classified a national asset, so we had to keep the vehicles away from each other. Just like we were talking about that dual ferry, they didn't want to have one asset be destroyed at the same time as the other one. That's probably the other reason why the Rogers Commission [Report of the Presidential Commission on the Space Shuttle *Challenger* (STS 51-L) Accident] said if you lose one, then the program's down for two years while it's being modified.

The original plan was to assign one at El Paso, and we would rotate them. 905 would come to El Paso when 911 would come operational. I think that went on for a couple years, maybe three. I'd have to go back and look and see exactly when we decided to make the move, but it had a lot to do with the contract out at Evergreen [Air Center] at Marana [Arizona]. What

we decided to do was while one airplane was in maintenance the other would be at Edwards Air Force Base. There really wasn't a need now to have a permanent station at El Paso, so they elected to just rotate the airplanes through Marana. That's kind of how that happened.

ROSS-NAZZAL: Would you do maintenance on the plane?

LAROSE: Oh yes, we had our own maintenance crew. We had three mechanics that were assigned to the 747. It was a little easier for the Houston crews and myself to fly in El Paso than it was L.A., because it's now two legs to get to Edwards, but it's only one leg from Houston to El Paso. That was the training site for the STAs. The astronauts used to come out in the morning to go fly a morning flight, or [in] the afternoon, because it's only an hour and a half away. So when it come time to go fly the SCA, the pilots in Houston loved it because it was just an hour and a half away, and we jumped on an airplane and then go home at night. Versus a day, day and a half, sometimes two-day trip to get to Edwards to go fly a two-hour mission. It was convenient, it really was a nice thing to have at El Paso.

ROSS-NAZZAL: Where would you take the plane out when you flew it from El Paso?

LAROSE: Most of our locals were done at Biggs Army Airfield. Again, that was a fairly long runway, 13,000 feet, and it got us away from the El Paso International Airport. They don't like a large airplane in their traffic pattern when they're trying to land Southwest Airlines and American Airlines. And they loved it because Biggs didn't get a lot of work. The tower operators really liked for us to come over there and work in their pattern because it give them

training and it give us training too. It was a good working relationship with Biggs Army Airfield.

ROSS-NAZZAL: Those aircraft are nearly 40 years old. They're old, as we noticed when we went in them today. You told us about some of the mods [modifications] for the vehicle, but what upgrades have there been for the aircraft?

LAROSE: Henry probably could talk to you, because he controlled the service bulletins and the ADs [aviation divisions]. I don't remember a whole lot of modifications. I mean, new equipment aboard the airplane—I remember deactivating center tanks and scavenging pumps when that TWA [Trans World Airlines] problem occurred with explosion in the fuel tanks [TWA Flight 800 accident]. But we just deactivated, we didn't put in any new equipment.

The only modification that comes to mind on 905 was autobrakes. We didn't have autobrakes on 905 when I first come onboard, so we made that modification. I just can't think of anything off the top of my head that in the 20-some-odd years that we ever did any mods. We did maintenance and changed components out, but nothing new as far as systems aboard the airplane that I can recall.

ROSS-NAZZAL: Tell us about the maintenance of the plane. Would you as a flight engineer tell the mechanics out at Dryden, "Hey look, there's some issue with the plane"?

LAROSE: Well, the flight engineers—I'll tell you a little history—when we were hired on, we were hired on as quality assurance flight engineers. So we took on that role, not so much

directing but just making sure the quality was done. Our bosses at that time said, it's good for our flight engineers to be part of the quality system. Who better to watch and make sure that the job gets done, because they're the ones that are going to have to get aboard the airplane and go fly. That was one of the thought processes why they selected us to do quality and flight engineering both.

The other thing was that, yes, I was involved with maintenance decisions and making those calls. The contractors are the ones who do the maintenance, so we let the contractors make the calls on the maintenance. They discuss it because they belong to the NASA operations, so they run everything by us, and if we object then we'll talk about it. That's kind of how the process works.

ROSS-NAZZAL: Is there a regular maintenance schedule for the vehicles themselves?

LAROSE: Oh yes, because it's just like any other airplane. Sometimes scheduled maintenance gets in direct conflict with operations, so sometimes you have to make that decision. We're here to fly airplanes. It's a tradeoff and you have to say, "Okay, we'll have to defer it." But when the operations stop, then you do know that that airplane goes down and we have to do the maintenance before we go fly again. Sometimes the tempo of operations conflicts, so you have to make the adjustments to make it all work. That's the things I don't miss. I don't miss those discussions at all.

ROSS-NAZZAL: Would you tell us about some of those discussions?

LAROSE: Oh, it's just pilots want to fly and the operations want to fly, and maintenance, "We're held to a schedule. If something goes wrong, then we're responsible." It's one of those things that sometimes you just have to lay the law down, say that this has to get done. They're good about it too. They know that there's some things that you just have to bite the bullet and do the maintenance.

ROSS-NAZZAL: We've been talking today about 905 and 911. What planes fall in between 905 and 911?

LAROSE: Well, NASA 910 was a T-38, so it just depends on what the number is. When I come onboard—the STAs, the first one was 946 and -47. We tried to find the serial numbers or the production numbers as close to those airplanes as possible at Gulfstream [Aerospace]. Their serial number was 146 and 147, so that's how they got NASA 947 and 946. They just put the 9 on it because Johnson uses 9 and Dryden uses 8, and I think Ames [Research Center, Moffett Field, California] uses 7. Every Center has their own number. Those numbers are picked, like I said on 146, due to the uniqueness off the production line.

The next STA was NASA 944 and then 945, but it didn't come sequentially. They were later than -46 and -47, but because their serial number was earlier that's why they picked that. Sometimes they try to go in order, but sometimes that doesn't work either. You look at 905 and 911, it's a 747, but there's a couple T-38s in between them.

ROSS-NAZZAL: How did NASA decide which SCA it was going to fly for the ferry flights?

LAROSE: Well, like I was talking about the maintenance schedule, if the one was in scheduled maintenance in Marana—the 905 was not going to go fly, 911's available. It was just whatever airplane was up at that time was the one we used, it was just a matter of the maintenance schedule and where it was at at the time.

ROSS-NAZZAL: Your baby has just been retired, 911.

LAROSE: I know, it's a sad moment. Henry did me a favor. I was pre-flying 905, and we were going to fly both airplanes. One was going to take off and go straight to Palmdale, and I was going to stay back and do a local with Bill Rieke and Bill [William F.] Brockett. Henry come up and he says, "You need to go do a walk-around one more time on the airplane before we can call it quits." That was kind of fun.

ROSS-NAZZAL: Is it the newer of the two?

LAROSE: Well, it was the latest of the two. It's not the newer, because it had more flight time on it than 905. When we got 905 I think it had a little over 10,000 hours on it. When 911 came onboard it had over 30,000 hours on it. So 911 had a little more passenger time on it, but for ferry time, I would say 905 had more ferries than 911. You'd have to go back and look at the archives, but I'm almost positive it did. When I come onboard on the SCA in the '90s—I think I was involved with over 30, 35 ferry missions, and it was a lot more before I come onboard. Do you know what the total is?

ROSS-NAZZAL: I think it's 55 ferries from Edwards.

LAROSE: Well, then I guess I did more than I thought. I was thinking there was 50 before I come on, but I don't know. I didn't do any counting until we got to looking at the numbers.

ROSS-NAZZAL: Why did NASA decide to retire her instead of 905?

LAROSE: You know, I wasn't part of that discussion. They just picked 911 to be the one that goes down. They took, I think, two engines that had better time and condition on them and put them on 905. I think I was told that we had some gear-overhaul issues and some time-change issues that it was too expensive to get repaired and modified, so they decided just to take the one down. I think that's what I remember in the discussion.

ROSS-NAZZAL: As you mentioned, a lot of the early missions landed out at Edwards, and there were a lot of ferry missions back here, and then of course taking the orbiters from here out to Palmdale. As time went on, there were fewer and fewer flights. What impact does flying the plane less and less have on the aircraft itself?

LAROSE: As I told you earlier, we're multi-qualified and so we kept our hands in other projects. When the ferry mission come along, you found any way to get off the other schedules to get back. They were few and far between, so you really worked the schedule to make yourself available to go fly. We were still required to go out every three weeks to fly our locals and keep our landing currencies going and then going to the simulator twice a year, so that's how we

maintain our currency. When it came time for ferry mission, yes, it was pretty exciting times to get back to rolling again.

ROSS-NAZZAL: Does it have any impact on the aircraft itself, though? Because I know if you don't drive a car on a regular basis it's problematic.

LAROSE: Yes, they're very temperamental. If you don't use them and you sit for a while, the systems just don't want to go. Once you get up and running and work them, yes they work, but that initial get them moving is tough sometimes. We found that especially when we were out at Marana. When those airplanes were down for three months at a time and there was no flying done on them, when it was time to roll out we had all kinds of issues. But you work through them. Nothing major, it's just pain to try to get it going because it just doesn't want to leave the parking spot.

ROSS-NAZZAL: Are there any funny stories you can share with us about some ferry flights or the planes themselves?

LAROSE: No, not really. Great moments, great guys to fly with. [Francis R.] "Dick" Scobee; Joe [Joseph S.] Algranti, the first guy that I went to work for; [C.] Gordon Fullerton, great guy, great individual; and just the people that I've been involved with. With the 747 and the orbiter on top, you don't sneak into town with that. It just brings everybody out, and you get to meet the different folks and see their smiling faces. Especially at Fort Campbell [Kentucky], taking thousands of those students through, busload after busload. I'd love to go back and see how

many students we touched, that really wanted to stay with NASA and stay with math and science and do those kind of things that we're doing right now. I'd love to go back and see if any of them did take the challenge. Those are the good moments.

ROSS-NAZZAL: Talk to us about that ferry flight.

LAROSE: We got into Fort Campbell and I think the hurricane was Hurricane Ivan. It was stirring up in the Atlantic, so there were some concerns that if we got in [to KSC], could we get it offloaded and get it to the [OPF, Orbiter Processing Facility]. Or do we just need to sit away here and let it come in and then pick up the pieces and figure out when we need to bring it back in. Well, they elected to just set it out. If I remember right I think it went northeast, kind of went up and petered out and never even come close, but it ended up delaying us. I think we ended up staying there four days.

The NASA managers at the time decided this was a great opportunity to open it up. But we were being hosted by an Army base, Fort Campbell, so they had to run it by Fort Campbell PAO [public affairs office] and the commander to find out if we could have schools around Kentucky and Tennessee come in and view it and have a few of us, just like on media day, answer questions. We started early in the morning until it was dark. You just saw busload after busload, and you kept thinking, "Where are they finding all these kids?"

It was great. Some of these kids had never even seen an airplane before, and now you're bringing the Space Shuttle. They've heard about it, so it was pretty emotional sometimes, and they brought me right down into it. It was great to be part of it, those were fun times. Not saying that this mission here is not going to be fun, it is. Some of those folks up in D.C. I'm sure

haven't seen some of this stuff either, especially doing the fly-bys. A lot of folks are going to be looking up.

ROSS-NAZZAL: What sort of emotions or feelings do you have now that you're taking *Discovery*?

LAROSE: Sad, sad. It's an era that's treated me very well. Like I said, I started in the late '70s, but I've been retired for about four or five years now. It was kind of a unique experience when I landed here and saw a lot of activity on the ramp. About six, seven, seven o'clock, we were driving back to Cocoa Beach [Florida], and to drive by the [OPF] and the launch sites are all gone and not see any activity, it's hard for me to grasp the program is coming to an end. It's hard.

ROSS-NAZZAL: Yes, it is tough. Rebecca, Sandra, do you guys have any questions?

WRIGHT: I've got a couple. One, when you were giving us the guided tour, we found another classic piece of equipment onboard. It was a microfiche reader. Can you share why that is still there, and did you ever use it?

LAROSE: Yes, we still use it. It has our maintenance manuals and our parts catalogues and such. That's old technology. You got to remember that's a 1971 airplane, so a lot of the manuals—we have hard copies of the manual, but we have microfiche. It's hard to get updates on the

microfiche, but we still get some. Sometimes old technology is good technology. Just because it's new doesn't necessarily mean it works well.

WRIGHT: Before we got started, you mentioned that today about one o'clock you were going to go through some fire training. Are there specific types of training that you go through?

LAROSE: Yes. Some of the things are unique to this airplane, because we stripped out a lot of stuff. A lot of those crew doors don't have slides and don't have emergency escape exits, so we deactivated them. What we have to do is show the fire department which doors are activated, what doors have slides, what doors don't have slides, how to get us out of the seats if we become incapacitated, and we can't get out. We have to show them how to get us out of there, how to shut the airplanes down. They can get the electrical power off and shut the engines down if we can't do it. Those are the kind of training things we do, and we tell them how many crew members are onboard the airplane and where they're going to be so during a fire, smoke, they know where to go.

I've got another crew coming in at one o'clock, the second shift. We had first shift yesterday and then third shift will be tomorrow. It's great. That's sort of like giving tours too. The fire guys don't get to do this kind of stuff, so they're kind of taken away. If you give a little extra time and tell them what you do and what the mission requires, it's a good working relationship with those guys. They don't know that kind of stuff, and it's kind of fun to talk to those guys, especially the ones that are going to have to come and get you if something goes wrong.

WRIGHT: Are there other types of those safety trainings?

LAROSE: Oh, yes. Typically if we're going to spend any time, like at Fort Campbell, before we started the tours we had the fire department come out because if we have an emergency we want those folks to know what we have to do to save people, and to save the airplane if we can.

WRIGHT: Just one more. As a flight engineer walking around a few hours before everybody's ready to go, you really do have that option that if you see something that's a showstopper, you have to call it. Did you find yourself in that position during those 30, 35 flights?

LAROSE: I'm sure I did. I'm trying to remember. I've had some issues when we got on the airplane that it was a no-go, but it's been one of these things that we can talk about and we can go with. I've had a generator that didn't come online. It give us an option in what we call our MEL, our minimum equipment list, that basically says you can take off with three generators versus four, but this is what you have to do in order to safe the CSD [definition?]. We had to disconnect the CSD before we went to go fly.

It wasn't a showstopper, but yes, we had a malfunction and we had to take care of it. You hate to know that if you took off with something that you weren't supposed to go fly with and then you were in the air and—whoops. Those are the kind of things you want to talk about and discuss before you get in the air, because in the air you don't have any options.

WRIGHT: Thank you.

ROSS-NAZZAL: Just one other question. Tell us what it's like flying inside that 747 once you're up in the air and how different it is.

LAROSE: Oh, it's pretty awesome. You got the thing [orbiter] strapped to you and you know it's there. I mean, you could hear the vibration of it. Especially when you get close to towns—well, you don't have to get close to town. You can be up flying and you hear airliners talking to ATC [air traffic control], "Where's the Shuttle at?" They'll call them in and give them our clock position and tell them where we're at, and sometimes we'll see them come in on us to let passengers see it. You look out, and you see it. I've never been able to have good enough eyesight to see passengers looking at it, but you know they're there. One of the pilots one time rolled the wing. He said, "That's everybody going from the right to the left." I kind of laughed and chuckled, "Yes, okay."

ROSS-NAZZAL: Is there something that we may have missed that you thought we should talk about?

LAROSE: No, I think you got it pretty well covered. Sorry about getting a little emotional, but that's the way it is.

ROSS-NAZZAL: We understand. Well, thank you very much for your time today.

LAROSE: You bet.

[Tape break]

LAROSE: Dryden at the time, the lakebed was full of water so we knew well in advance that we were going to land at White Sands Missile Range [New Mexico]. A lot of the equipment showed up early on by train. When it come time for landing the 747 out there, it was like landing on a runway. The first inch was gypsum, kind of soft, but when we broke through that soft gypsum it was like a hard concrete. The handling characteristics were no different, and the wife really didn't really understand. "Was that a one-inch of mud?" No, it was just a crust. It was really just like a hard surface, and we knew that we could land the Shuttle the same way. They had load testers out there at White Sands that could test that surface so they could maintain it and it wouldn't sink or rut or veer off the side of the runway. We had a good understanding.

My involvement was not with the SCA at the time. I was flying the weather flight with John [W.] Young and Dave [David] Mumme. When we waved off the first day, there was some concerns because our forecast didn't look like it was going to be much better the next day. There was a lot of discussion because, remember, we were still in flight test mode on STS-3 and we weren't going to be out of flight test mode until -5 or -6. If I'm not mistaken, I think we went up to -8 before we really got out of flight test mode.

Our requirements were to land on a lakebed. Well, we didn't have many lakebed options. We only had White Sands and Edwards, so we said, "Okay, we need to have an alternate in case we can't get into White Sands." They didn't have a lot of expendables on fuel because it was just a two-man cockpit and they were only going to be up for a short period of time. So they were making a decision.

Well, we're going to have to support KSC, so we sent one of the SCAs down. I stayed in White Sands and flew the weather flight the next day. The winds were pretty high, but nothing like it was the first day. The sand and the dirt was up to 5,000 feet and kicking up, and you couldn't see any visibility the day before. The next day most all the sand was gone, but the winds were still pretty high. They were right down the runway, so we eventually landed.

The biggest thing that come afterwards—in the spring in El Paso and Las Cruces you've got a lot of blowing dirt. That's the only thing you've got to put up with out in the Southwest is high winds in the spring. I like the falls, and if you can stand the heat—it's a dry heat, but that's the only thing. We don't have tornadoes or hurricanes and torrential downpours or anything like that, we just get the wind in the spring.

To make a long story short, because we had a lot of wind and the gypsum was blowing all the time, it blew in between the tiles and it caused a big problem with cleaning the orbiter once it got here. That rumor got out that we really don't want to land at White Sands anymore, but they made some corrections and built a hard stand, and they were going to build a temporary cover to put over it if we ever had to use White Sands again. That's a little quick history of being involved with the landing, but I was not part of the SCA crew to come in and pick it up. I was there to help a little bit with the logistics. That's the short story of how I got started.

[End of interview]