SHUTTLE CARRIER AIRCRAFT ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT

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INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is April 12, 2012. This interview with Ron Feile is being conducted for the Shuttle Carrier Aircraft [SCA] Oral History Project at the Kennedy Space Center [KSC]. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright. Thanks again for taking time to meet with us today and sharing this lovely conference room with us. We certainly appreciate it.

FEILE: My pleasure, it's always fun.

ROSS-NAZZAL: I thought we'd start out by having you give us a brief overview of your NASA career.

FEILE: I've been a contractor since I came here 30 years ago. I came in 1982 as a security and fire and medical dispatcher, because of my radio experience with the Federal Aviation Administration [FAA] as an air traffic controller for a lot of years prior to that. In 1982 I started there, but only stayed with that group a short time because of the opportunities that arose when NASA turned the Shuttle Landing Facility over to the contractor. They had run it prior to January of 1983 on their own, with NASA oversight. That contract was called the BOC, the Base Operations Contract.

They turned the facility over to that contractor, EG&G [Inc.], in 1982, and then they needed personnel with aviation backgrounds to assist with the operation of the facility. That later turned into the opportunity for positive control. The air traffic control side had never been instituted at KSC until after 1983, but there was a plethora of air traffic controllers that were available after the strike firings of 1981 and quite a few of them ended up on the staff of the Shuttle Landing Facility. There was a lot of talent that wasn't being used for the air traffic control purposes anymore until we all assembled here. NASA realized the value of having positive control on their runway at that time and instituted and purchased an air traffic control tower, and we started using positive control for separation of aircraft.

ROSS-NAZZAL: Can you tell me what positive control is?

FEILE: There are a lot of smaller airports and some larger airports that don't have the number of traffic count that justifies positive control, or air traffic controllers telling pilots specific instructions for how to enter the pattern, how to land, how to take off, and maintaining the FAA's separation standards for those aircraft coming and going. So by instituting positive control here, they actually had a lot more control, and increments of safety stronger for the separation of their NASA aircraft and any other approved aircraft that were landing here after 1984. It worked out pretty well.

We started and instituted that, put our own radio hardware in, and started off with that kind of separation for the runway. I think the astronauts have appreciated it over the years, especially given the extensive amount of training that they've done here as well as the landings and takeoffs that got to be much more frequent over the years.

ROSS-NAZZAL: Tell us about the facility itself. How long is the runway, how wide?

FEILE: The facility is one of the largest paved runways in the world. It's 15,000 feet of concrete, 300 feet wide. Most airports are 150 or 200 feet wide, and very few are larger than 15,000 feet. There's an additional 2,000 feet of length included in to make it 17,000 feet, with the additional 1,000 feet paved weight-bearing overruns that are on both the north and south end of the runway. So the total is actually 17,000 feet, more than three miles long, of paved surface. It's pretty extensive, and the runway is one of the thicker runways in the world. When it was engineered by NASA it was done right. It has served the program very well with extremely low numbers of maintenance and improvements required since it was instituted and built in 1976.

ROSS-NAZZAL: What sort of aircraft besides the SCA and orbiter fly in and out of here?

FEILE: I've got pictures. In fact, I have a video presentation of slides of former aircraft, including a lot of aircraft that were here before my time, that time between 1976 and 1983. There seems to have been a lot of interesting aircraft that have floated around. The first aircraft that landed here was the [KSC] Center Director Lee [R.] Scherer in 1977, when they christened the runway. The presentation that I have would include a lot of the videos that the NASA library archivists put together regarding those kinds of aircraft.

The ones that I've seen since I've been here have been primarily dedicated to the program. When I came in 1983, the program only wanted to use the runway for Shuttle program aircraft. They weren't even allowing the Shuttle Training Aircraft [STA], NASA aircraft from

Houston [Texas], to land here at that time. They were deploying those aircraft from Ellington [Field] in Houston up to Patrick Air Force Base [Florida] and starting their Shuttle training missions off Patrick Air Force Base.

Finally, smarter heads prevailed and allowed a lot more of the NASA aircraft to use the facility. Not just for the potential of Shuttle landings and the return to launch site after launches but also for their T-38 [aircraft] transitions with the astronauts and the Shuttle training that was going on. A lot more activity was instituted, and that was an evolutionary process from 1984 and '85 on when the contractor took over. We were able to influence them, I think, and encourage them to get more use out of the asset that they owned.

ROSS-NAZZAL: Has the number of air traffic controllers changed over the years as a result?

FEILE: Oh, yes. There were only four or five at the beginning, and then before the end of the Shuttle program we were as high as 12. The reason we got as high as 12 is because we were doing additional work besides working for Shuttle. The most modern air traffic control tower, the one that was built by 2006, now houses the military radar unit air traffic controller, who is employed by the institutional support contract, our group, but is actually paid for by the United States Air Force so that they can watch the airspace of the Eastern Range. That responsibility in the control tower has a separate position using the radar to keep the good guys in and the bad guys out. It's basically there to survey a much larger airspace than that which would just normally be controlled by the air traffic controller for the runway.

Our involvement as air traffic controllers—for every launch of an expendable rocket now, as well as for Shuttle for so many years—was to leave that seat and go over to the United

States Air Force Cape Canaveral Air Force Station area to join up with their surveillance team and take care of all of the aircraft that are associated with the , and Shuttle launches and landings. We actually interfaced as part of the Air Force team to make sure that the airspace was clear, and that there were no obstructions on the range to make a hole in the sky for the rockets to launch into. We're still doing that to this day.

ROSS-NAZZAL: So you're keeping busy then, with the closeout of Shuttle?

FEILE: We're keeping busy even with the closeout of Shuttle, yes. There are a diverse number of things that we do here besides the air traffic control functions and the military radar unit functions. It's also that same team that does the daily operations on the Shuttle Landing Facility runway as far as inspecting and instituting the maintenance and making sure that everything is taken care of for the continued readiness of the runway for whatever mission NASA decides for us.

ROSS-NAZZAL: How many people work out here in total?

FEILE: The number of air traffic controllers we were talking about went from a low number to twelve, but then after the Shuttle program we backed off to eight because we cancelled one of the shifts. We were doing two shifts of air traffic controllers a day at the control tower and around-the-clock protection of the Eastern Range airspace while Shuttle was still active, until after the Shuttle program in August and September of 2011. Then we cut back to eight controllers because those two shifts were lost. Our team is also comprised of aircraft servicers who handle

taking care of the ramp and the aircraft—fueling, baggage handling, marshalling, and any of the servicing that's required for whichever aircraft do come here.

ROSS-NAZZAL: Let's turn to the Shuttle Carrier Aircraft, which is what we're interested in today. What role do you play in the Flight Readiness Review for an SCA?

FEILE: We really don't have a role on the readiness side, other than to state that the runway has no limitations for what they need for arriving or for towing and mating or demating. That's the only issues that we have, and the rest of the conditions are taken care of by the flight crews of the aircraft that are involved.

ROSS-NAZZAL: What do you have to do to prepare to accept the arrival of Shuttle Carrier Aircraft out here?

FEILE: We've got one of the largest runways in the world, and one of the smallest ramp areas for the type of work that we do. So we have to be very careful to exclude any of the other aircraft that are too large or not suited to the requirements of Shuttle carrier operations. We dedicate the entire ramp area to handling the Pathfinder aircraft that precedes it, and the Shuttle Carrier Aircraft itself, which is huge, and any of the other associated support aircraft that might be involved with the actual ferry. Primarily that's T-38 activity, with the astronauts that are coming or media-related to the operation itself.

We make sure via PPRs, Prior Permission Requests, that we deny anybody that doesn't need to be here and make sure that we have properly planned for everybody that does need to be

here. Quite often parking scenarios get to be unique because of the number of aircraft or the type of handling that we do. We've had different sizes of Pathfinder aircraft before, and sometimes the parking spaces are so premium that we have to do some towing or relocating of aircraft in order to make sure everything fits on the postage-stamp-sized ramp that I have.

ROSS-NAZZAL: When you're referring to the ramp, is this the space out here [demonstrates]?

FEILE: Yes. The ramp area is the area that lies just east of the runway, and the edge of that is where the mate-demate structure was built. So you can roll right off the ramp and into the structure with the Shuttle Carrier Aircraft or with the orbiter, depending on which process you're doing—either the mating or the demating.

ROSS-NAZZAL: Do you have to do any checks of the runway itself, or do you have to have any special equipment?

FEILE: We're obligated by contract to provide a daily inspection of the runway to make sure it's clean and ready to go, and we also physically walk down the runway prior to orbiter launch and landing events. We also have mechanical sweepers, actual physical sweepers that come out and sweep the runway to make sure that it's clean for not only the landings, but also the towing back to the Orbiter Processing Facilities so that they can start the processing all over again for the next mission. While those orbiters are rolling around, we have to make sure that the tow ways and runways and ramp areas are all clean for no tire damage en route.

ROSS-NAZZAL: If an SCA flight was expected, say on a Tuesday but they had weather problems and you had to delay for a couple of days, did that ever present any problems for your facility here?

FEILE: We've been through some extensive delays with orbiters coming across country with the Shuttle carrier in the past. There are always weather systems or mechanical issues. They've lost engines on departure coming off Edwards Air Force Base [California] before. [It] causes them great grief. You can get up to a week or two delay over issues like that, and mostly it's just a day or two that's involved with the process of getting it across country. They use an alternate number of civilian and military bases to avoid the weather, and sometimes you never know which one they're going to before the actual weather itinerary is decided upon.

Based on where they go, sometimes they can't make it from there to here in one hop, so there's another stop involved, and that can take another day. It can take significant amounts of coordination in order to prepare for the fuel loads that they need and the Pathfinder requirements that are involved with whoever is leading the aircraft. The Pathfinder does an important job of not only toting the hardware and people back and forth, but also to preview the weather conditions en route all the way across the nation.

ROSS-NAZZAL: Since you have to keep that ramp free and tell people that they can't come in—

FEILE: For that reason we have to do that. Plus it's a realignment of our own staffing, because a lot of times when they came the process started immediately to do the offload. Sometimes that runs a third shift through the night, significant amounts of people and shop support in order to

provide the lighting and the generators and all of the ground support equipment that's required to do the job.

ROSS-NAZZAL: How do you stay in contact with the SCA? Do you know where they are from the minute that they've departed Edwards?

FEILE: More recently, in the last few years, there's a much more significant flight tracking capability available. In the past it had always been through the Houston team, who provided the pilots. They're technically responsible for the aircraft. We kept in touch with them explicitly to know what changes and modifications or what weather they were encountering to impact their itineraries as they came across country. They had a flight operations group at what used to be Ellington Air Force Base [now Ellington Field] in Houston.

ROSS-NAZZAL: So you just talk with them on the phone or get an email?

FEILE: In the past we had talked with them, but now we can get more web-related information for tracking the aircraft and the Pathfinder across country. In the more recent years we were able to accomplish that and then just supplement that information with the information that was going back and forth. We started this process without ever even having cell phones invented, so you can imagine how the world has changed since the Shuttle started doing the Shuttle carrier operations without any mobile phone capability in your pocket whatsoever.

ROSS-NAZZAL: When you came, you had mentioned that originally the facility was run by NASA. Did they have a process and procedure in place for accepting the SCA that you just then adopted, or did you scrap that and start out with your own set of procedures?

FEILE: The procedures were all put in place by NASA in conjunction with, I think, the first contractor that was in charge of the orbiter handling. The separation of those contracts are probably noteworthy insofar as NASA handed off this facility to the Base Operations Contract owner, EG&G, in 1983. Prior to that the Orbiter Processing Contract was owned by Lockheed [Corporation] and then later by United Space Alliance [USA]. They always maintained the responsibility for the maintenance of the mate-demate device as well as the procedures by which the orbiters were handled.

It was kind of a hand-in-glove thing when USA and its predecessor, Lockheed, were interfacing with us in order to make sure—together—that we were ready to not only get the aircraft in but also to conduct the entire process to get it processed after the demate and back out here. A lot of people think that it's just like one-stop shopping, but both of the different contractors had to take care of different preparations in order to make sure that the things went well as soon as the aircraft landed.

I don't know what they did before 1983, but NASA had already handled five of the Shuttle missions, and all of those Shuttle missions had landed at Edwards Air Force Base, or [NASA] White Sands [Space Harbor, New Mexico] for the STS-3 mission. All of those returns on the Shuttle Carrier Aircraft had been conducted successfully and carefully before my time.

ROSS-NAZZAL: You mentioned that you would stay in touch with people out at Aircraft Ops [operations] out at Ellington. When did you finally get in contact with the crew as it came in? Was it pretty close, like Orlando [Florida]?

FEILE: They would call when they got back on the ground at their end-route destinations and give us a heads-up on their progress and any modifications to their status. Continuing to have healthy aircraft is important. You don't want to be halfway across country and have major issues with a bad aircraft because you're stuck in the middle. The Air Force bases that they used across country were there to help them, just to remain overnight or until the weather improved. Those things were important to those flight crews.

When they called us they told us that they were devising a new flight plan, and they would give us a new expected time of arrival. We would push the support requirements forward accordingly. We did that mission after mission. Then finally it evolved to where the Shuttle Landing Facility became the primary landing site, and things happened a lot less often because of the frequency with which we were able to safely land here, which was always the intent of the program from the start.

ROSS-NAZZAL: When were you in contact with them by radio?

FEILE: The actual radio contact didn't come until they had gotten within 20 to 30 miles of the field. Then it was usually a matter of flying around the Kennedy Space Center and the central Florida area, including [Walt] Disney World [Resort], just to show off the national asset that was provided by our taxpayers. They did have a lot of fun doing that up and down the coast from

Vero Beach to Patrick Air Force Base, Cape Canaveral to here. The visitors complexes are always an attractive area to get a lot of visibility in Orlando and, like I said, Disney World even sometimes.

ROSS-NAZZAL: Did you have to provide any sort of security measures when the SCA would come in with the orbiter on its back?

FEILE: Security was always aboard the Pathfinder because of the security requirements that you might run into across country, not knowing where you were going to land if weather became an issue. Those security teams were always in touch with the landing-site personnel across country. Then there was always a significant amount of security here at the gates to prevent people that weren't related to the mission from getting in and impacting or threatening the orbiter and the Shuttle Carrier Aircraft as a national asset. Those things were always put in place and understood in advance by everybody that was mission essential.

ROSS-NAZZAL: Once the SCA lands you have to shift gears. What's your responsibility?

FEILE: The hot orbiters that came in after space missions were always still loaded with partial loads of hazardous propellants, so the issue is you have to make sure that none of those fuel tanks have been corrupted or leaked across country. If they were dripping on the Shuttle Carrier Aircraft, they could create quite a hazard for whoever was in the aircraft as well as for anybody on the ground that would have to handle it while it was in the slings of the MDD [mate-demate device].

The standard practice was to stop the orbiter and Shuttle Carrier Aircraft a thousand feet from the end of the runway, where there's nothing out there but canals on both sides, and have a sniff team actually sniff the orbiter and the Shuttle Carrier Aircraft to make sure that there were no detectable hydrazine leaks or any other ammonia issues around the aircraft to make sure that it was safe to bring in. Then they wouldn't start the engines again, they would just hook up the tow bar, use the tug, and drag the aircraft in from a thousand feet from the south end of the runway. That final quarter-mile leg was always accomplished via tug and tow bar.

Once it was a safe aircraft, then there was always a VIP [very important person] mission and a media mission for coverage that was accommodated in NASA. As long as the orbiter and the Shuttle carrier were safe they would pre-stage the media for the events, and sometimes they invited the entire KSC population of badged personnel. They were in the area for the first-time arrivals. The most notable was the last orbiter, the *Endeavour*, which was one of the most recent that I can remember. A significant amount of KSC personnel were here for the orbiter arrival at that time.

ROSS-NAZZAL: Did you ever have some instances where there had been some leaks of hypergols [hypergolic propellant] or hydrazine?

FEILE: I don't remember any. I don't remember any issues that they encountered between the time they left California or White Sands and got here. That probably would have created a significant impact. They would have had to put personnel into SCAPE [Self Contained Atmospheric Protective Ensemble] and then safely go in and secure that. I don't know how they would do that with the Hi-Rangers and such that would be required to reach the orbiter sitting on

top of the Shuttle Carrier Aircraft with a leak of that nature. That would have been an interesting operation, and I don't recall that ever happening.

ROSS-NAZZAL: Yes, that probably would stand out in your memory.

FEILE: It certainly would.

ROSS-NAZZAL: Tell us, if you would, is there a difference between landing an SCA with an orbiter on its back versus another type of aircraft that you might see come into the facility, or the orbiter itself?

FEILE: Well, the orbiter was always the more exciting because it always seemed that there was a potential for more to go wrong when the orbiters landed. They've always mentioned the possibility of using other facilities because of a skip that they might get off the atmosphere on reentry or some other navigational problem that they might have coming en route, so we always were concerned about that.

We've had instances where the orbiters have changed the end of the runway that they used within the timeframe of them coming back into the atmosphere. In the last 10 or 15 minutes of the flight, if the Shuttle Training Aircraft, which was diving at the runway in advance of the Shuttle carrier coming back, encountered anything that they didn't like, like turbulence or unexpected shower development or wind direction changes, then they would actually go through CapCom [capsule communicator] in Houston and advise the orbiter to change the destination runway.

The common means of getting here, the alignment, is to fly over the runway and then do a 270-degree turn back to one end of the runway or the other. That was commonly accomplished, and it always threw the convoy group that was ready to meet the orbiter off. They have it already aligned in two particular directions, one to come forward and one to come aft of the orbiter after the wheels stop. As soon as they changed the runway it would put the wrong group in the wrong place, because the forward group would be aft, and it was too late to change any of that. It always made life interesting for the people that processed the orbiter after it landed.

As far as the rest of the Shuttle carrier landing techniques and things like that, the runway had to be prepped according to the documentation that was out there for the program. It's different for orbiters than it is for Shuttle Carrier Aircraft only because of the different types of handling processes and the equipment that needs to meet each is different. There's a much smaller team that handles the Shuttle carrier arrival, and there's a smaller amount of urgency involved with the Shuttle carrier than there is with the orbiters.

In comparison to other aircraft that we've handled—we've handled Russian Antonovs [AN124 Ruslan] of considerable size and Ilyushin [Aviation Complex] aircraft from Russia with their payloads and administrative agreements. We've had the Russians come over to sign the agreement whereby the United States and Russia would combine their efforts and have joint use of the Mir [space station] when the Mir was hot, and so those aircraft have landed here.

We've had a lot of larger VIP aircraft and other hardware deliveries. We had Boeing 747 and C-5 and C-17, so we've had domestic and international arrivals for payloads. We're still doing that with some of the payloads and payload fairings that are required now for the other missions of Atlas and Delta [rockets] and SpaceX [Space Exploration Technologies

Corporation]. We're still handling flight hardware deliveries, and there's never two the same. Preparations are always unique for one reason or another, based on size or weight or hazards involved, so we have to treat every event, including every Shuttle Carrier Aircraft, as pretty unique as far as the planning of hardware requirements for their support.

ROSS-NAZZAL: Is it different accepting an SCA that doesn't have an orbiter on its back?

FEILE: An SCA without an orbiter is just another Boeing 747, so the answer is not usually. It's usually a much more benign operation, a lot easier to handle.

ROSS-NAZZAL: Does it come out here to this ramp or does it go somewhere else?

FEILE: The Shuttle carriers have landed empty when they've come to mate with the orbiters to take them back out to Edwards and Palmdale [California] for maintenance. Those are the events where they would frequently come empty. I can't remember any event that they ever came that didn't involve either bringing or prepping to take out, so they never had an administrative mission or any kind of cargo delivery. Those kind of things were always handled by other NASA aircraft, usually smaller.

Our most frequent events were the Shuttle training that was required. Every pilot and every commander had to have a significantly higher number of Shuttle training dives, and the ideal place to practice is the place you intend to land. As we evolved into the primary landing site, the number of Shuttle training events that came down here was much more significant. We knew all the astronauts, and we dealt heavily with the planning and staging for that, because they

would come and all of those sorties involved 10 dives at the runway by each aircraft, sometimes two aircraft at a time. That was more labor-intensive from a planning standpoint because of the lighting that had to be correct. We usually transitioned from nighttime into daylight or vice versa. There's a lot of shops involved with making sure that everything was ready on the runway for those kind of things.

We were also involved a lot in the modifications to the runway. We've created 50-foot asphalt shoulders on both sides for a total of 400-feet-wide paved in order to keep the ground traffic off and also to have a weight-bearing capability on the sides of the runway in case an orbiter ever should digress off the runway. They could actually get off the runway and perhaps recover back onto the runway without folding a gear, which is what would have happened if it had been grass or had been not weight-bearing. They were put on as an afterthought project that NASA decided upon.

We modified the surface at least once or twice, and we've also paved the thousand-feet asphalt overruns. We've instituted a centerline lighting system, which was never part of what Shuttle wanted from the beginning. They did a very unsafe thing by putting the centerline lighting system in the original plans for the runway and then realized that the light covers on that centerline were so much higher than the runway that it would create a bad harmonic on the nose wheel if the nose wheel ever landed on them. They would be bumping over the centerline lights every 50 feet for the entire length of the runway.

We recognized that was unsafe for the nose wheels, so they took them all out and put steel plates down to make them flush to the runway surface. Came back about 15 years later and said, "Now that the technology's improved, we think we'd like to go back and at least put in a partial centerline light system." I was instrumental in getting that going. Myself and one of the

astronauts, Mike [Michael E.] Fossum, decided how best we could do that and how many lights we needed.

They put in a partial system so that the descending orbiters could have both longitudinal and directional guidance from the centerline light system. Instead of every 50 feet, we only put them in every 200 feet because they could get pretty much the same guidance with that kind of a separation on the runway. That served them well for the last 10 or 12 years of the program. They had a few crews that did night landings, and as soon as you descend through the Xenon searchlights, the 8-billion-candlepower searchlights, and have them behind you, your shadow creates such a long obstruction in front of you that you actually obliterate all the centerline guidance that you would have with the orbiter landing. That's why the centerline lighting guidance was put in, so that there was no chance of being too far off centerline to recover.

You've got to understand too that back in the early part of the program, the first five or six landings, there was no nose-wheel steering and there also were no parachutes. So any increment of bad direction that you might incur from wind gusts, crosswinds on your orbiter in the last throes of being airborne, would throw you left or right of the centerline. Then you would have to recover using the brakes, because the brakes were the only means of steering the orbiter that they had. The nose-wheel steering was not instituted nor were there parachutes, so your speeds were guaranteed to be higher the further you went down the runway.

When they finally figured that out, they had a gap of time between the time that the *Challenger* [STS 51-L] accident occurred and the time we got back to flight. They used that wisely to modify the surface of the runway and to consider other improvements so that the rest of the program would have a safer series of landings and improve their chances of not blowing tires and such.

They actually did blow a tire on the last Shuttle landing before the *Challenger* accident, and they were fortunate that it was within the last couple hundred feet of positive wheel stop so that it didn't become a real danger to the mission. If it had been at a higher speed, it could have folded a gear and cartwheeled somewhere into the canals. The fact that they were able to survive that was a good thing. They learned a lot from that mistake, which could have been much more costly.

ROSS-NAZZAL: You mentioned that the runway had been grooved before *Challenger*, and then it was modified.

FEILE: Right, the runway was completely grooved when it was constructed. Those grooves were there because of the rapid drainage that they needed for the tropical situations they had here but nowhere else, because of Edwards and White Sands being so dry. They wanted to make sure that it drained correctly. The macro surface of the runway was so rough that they were losing way too many ply of tire as the orbiter mains touched down. They were coming back from space static and cold when they touched down, and then the friction of the rapid spin-up at 160 or 180 miles an hour—they were losing so many ply of tire that it became dangerous for them to continue doing that.

So the first 3,500 feet of both ends of the runway, they completely removed the grooves from that surface and made it much more smooth. Actually, we instituted a corduroy effect on the runway in the other direction in order to make sure that those ply weren't lost in the touchdown phase. Then if they had issues with skidding or concern for water, the center 8,000

feet was their braking area, and that was still grooved. With the additional ply that they had left on those tires, it was a much more safe operation as they braked.

ROSS-NAZZAL: Was there an issue for SCA tires, or was it only an issue for the orbiters?

FEILE: It was really only an issue for orbiter tires. We've never had serious rubber issues here, only because you can afford to stay in the air as long as you can to make sure that you're not left or right gear low, and you can slow it down as much as you need to with the luxury of length that we provide to all the aircraft landing. Those aircraft with engines are much more capable of making a smooth landing and not ripping up so much tire, so it was only the crucial landing locations and times for the orbiters that were of concern to the program.

ROSS-NAZZAL: If you would, tell us about preparing for a departure from this facility with the SCA. If you want to give the example of this current ferry flight [ferrying *Discovery* to Washington D.C.], what has to be done? What do you have to do? What do the pilots have to do? Do they have to file a flight plan with you?

FEILE: Yes. The day before the ferry the Flight Readiness Review takes place, and all of the prominent players speak to their preparations to make sure that the aircraft is ready, the orbiter is properly mated, the weather has been assessed, the destination is ready. Those kinds of critical things are spoken to, to make sure that everything is properly in place.

Then on the day of departure we take care of the Shuttle Carrier Aircraft flight plans and filing them. We obtain the clearances, give them to the pilots, make sure that their clearances are

good. Then the actual handling of the aircraft as far as marshalling and engine start and the fire extinguisher (bottle) handling—those kind of things are all handled by our staff of aircraft servicers, who take care of making sure that the aircraft transitions are safe all the way out to the runway, and then handed off to the air traffic controllers for positive control and departure. The actual clearance to go is given by our team, and then safe departure transitions are important.

We do the bird control and the animal control. That's more important than you think when you set this much concrete down into an official wildlife reserve. The Merritt Island National Wildlife Refuge is doing everything they can to encourage all those transient birds. Both the native and the migratory species are all out there at different times of the year, and we're at cross-purposes—with them encouraging, and us trying to keep a safe flight environment for arrivals and departures.

We're all tasked and provided with shotguns and .22-caliber blanks and screamers and pistols, and now we have a gas cannon system which makes noise to scare birds. Every effort's undertaken in order to keep the birds away from the actual aircraft transitions. That's another task that we've evolved into over the 25 and 30 years that we've been working here.

ROSS-NAZZAL: Do you have problems with gators [alligators]?

FEILE: There are very few small critters that we ever see as far as possum or raccoon or whatever, because the runway's completely surrounded by canals. Nobody in the animal world likes to swim except the gators, so we don't have issues with them. All of our canals are completely surrounded by animal-control fences. It's been a relatively safe environment except for the population of alligators which are in the canals, but you look at them as an asset rather

than a danger most of the time because they eat what tries to get across the canals, so they're part of the animal control also.

The times that they do get on the runway—I can handle those on probably 10 or 15 instances in the 30 years I've been here, and primarily that's mating season. They don't like to use the runway as a resting spot for basking in the sun. Even though the runway is very hot in summertime, they also don't like to get that far away from their comfort zone of the water. The distance between the canals and the runway are important, because the gators don't like to get that far away from the water. So all told, we usually don't have issues like that. We see snakes on the runway on occasion, a lot of rattlesnakes at times, and there are a lot of snakes on the perimeter of the runway but not that often.

Primarily it's the birds, and the birds are taken care of. And now we have assistance. Just recently, the Kennedy Space Center group has obtained their own USDA [United States Department of Agriculture] wildlife biologist, and he's here to assess and assist and take whatever means are necessary to make sure that the critters are properly planned for and handled in a real-time environment for safe aircraft transitions too. That's a good thing, takes a little of the pressure off our team.

ROSS-NAZZAL: Interesting, something I hadn't considered.

FEILE: There are some stories that go along with that too, as far as pulling them off. We've had good fun with that. Since 2008, NASA has evolved into inviting commercial teams onto the runway. There are R&D [research and development] teams and laser teams. We've hosted a NASCAR [National Association for Stock Car Auto Racing], IndyCar, and most recently the

Audi team from Germany for their R&D testing for their vehicles on the runway. The critters are just as much a problem for the cars as they are the airplanes. We've taken out a rattlesnake and one of the blue herons on the runway with a race car, the bird just happened to be flying too low at the time. The hazard is not just endemic to the aircraft, it's also to the vehicles.

We've actually had bird strikes on our own airport vehicles, because there's no posted speed limit out there. We're traveling at high speeds to get from one end of the runway to another end of the runway for success of aircraft operations when we were required to be there for Shuttle training, and a lot of times those high-speed transitions involve bird strikes themselves with just airport SUVs [sport utility vehicles]. The danger is there, and we're just trying to keep an element of control for it.

We've actually struck birds with the Shuttle Carrier Aircraft departing the runway. That was an interesting story. When the orbiter was going back to California, it was back for maintenance. The departure was routine in our eyes from an operational standpoint and from an air traffic control standpoint, and the Shuttle processing team came to us two or three hours later and said, "We think you had a bird strike." We said, "Why would you think so?"

They said because when the orbiter landed its first location en route, they found that they had feathers here and a mess here. They went back and actually had a public affairs video footage of the departure. The right wing of the orbiter, not the Shuttle carrier, had struck an osprey on departure at less than 1000 feet off the runway. It took the bird from flying to a dead standstill, and then a vertical drop right past the engines of the Shuttle Carrier Aircraft below it.

We were able to go out two or three hours later with the USA or Lockheed team that was responsible for the orbiter, and we actually found the bird, identified the species, and knew what size and what problems they might have. They could have busted an orbiter wing tile or

whatever with the carcass of the bird. So we took care of that, and that was kind of a surprising thing to actually have the video footage of the strike because it happened so fast.

ROSS-NAZZAL: Do you remember which vehicle it was?

FEILE: No, I don't. It could have been the *Enterprise* that was leaving for the Smithsonian [National Air and Space Museum, Washington, D.C.], which was 1985. If not, it was one of the other orbiters going to the West Coast. Then it would have stopped at an interim location for fuel, and that's when they determined that they had had a problem. Nothing that we noticed from the tower because the aircraft would have been up and gone by then, but the carcass was still on the field. It had hit it on the departure end of the runway and left it near the underrun at the other end of the runway.

ROSS-NAZZAL: How did you guys keep up to date with handling an SCA when it came in? As you pointed out, over the years things moved eastward. Originally most of the stuff was done out in California—most of the landings, all of the orbiter maintenance—but then it moved out here to Florida and it was occasionally landing out in California. How did you keep up those skills?

FEILE: The harder skill set was to be prepared time after time for the orbiter events. We had to be ready for the orbiter landing not every end of mission, but every launch day also for the event of an RTLS [return to launch site abort] if there was ever a problem on ascent.

I was working in the control tower area for the *Challenger* accident. That day, which was shortly after we had instituted positive control of the runway, we weren't sure what we had when we had the *Challenger* accident. We didn't know from the initial footage whether it was possible to recover from that and actually make an attempt to land the orbiter. Of course that was an impossibility. We weren't sure at the time. There was a period of uncertainty in there on the air traffic control side where we really had to prep for [a landing]. It only took 15 to 20 minutes to realize that there was no coming back.

Those are the kind of things that we do have to prep for, and that the air traffic control team works to a document as far as the readiness of the runway and the events. It got to be an understood routine of what you could expect, because the Shuttle Training Aircraft departed and did actual dives to the runway, not only before the landings but also before the launches. They had an actual position to be in for the launch, and a different position to be in for the landing so that they were out of the way of the descent of the orbiter. The orbiter would be coming back from over the ocean on a problem on an ascent, and if that was the case they would be coming from the east. Normal arrivals are from the west for end of missions.

All of that choreography is actually accomplished well in advance and understood by the pilots and the controllers alike. We're also watching NASA video footage of the CapCom and everybody else in the decision-making process to confirm that the weather is good enough and that the runway of intent to land is decided upon at the right time. Whoever figures out exactly when that orbiter is going to be here is darn accurate. We haven't had any problems with that, other than the OV-[102] arrival [STS-107 *Columbia* accident], which made it to within 15 minutes of Kennedy Space Center before we lost it over Louisiana and Texas.

But all of the other preps are pretty much understood. All the support aircraft have positions to be in. The helicopters provide security support. The T-38s are up first to assess the weather, and then the same pilot of the T-38 jumps into the STA. Then the STA does the dives and assesses the runway condition, advises Houston of that. Then the Houston team makes the decision for the landing in conjunction with the weather personnel, and once that decision is relayed to the orbiter they process through the computers how they want to do the de-orbit burns, which happen at a precise schedule.

All of that's understood well in advance by the control team, so we can track along to make sure that everything is occurring in the proper step sequences and at the proper times in order to make those landings. We've gone through a lot of landings that had one or two revs [revolutions], and we've lost a lot of first revs because of weather. Then you just cycle yourself into another 90-minute schedule for one more orbit of the Earth to see if the second rev is applicable or not. It was a regular routine, and most of the guys knew that and were prepped for what it took.

ROSS-NAZZAL: Any memorable or challenging SCA landings or takeoffs, other than the osprey?

FEILE: We did have one that completed a 3,000-mile journey, and then on the last 10 miles of the flight they ran into a shower. The shower's about the worst thing you can do, to run an orbiter through precipitation at high speeds. They did a significant amount of tile damage just by hitting that shower nearly in the pattern here at Kennedy Space Center.

The job function of the Pathfinder is to determine the weather in advance of the orbiter to keep them out of the rain or the potential for precipitation, and of course the Pathfinder's already

on the ground by 10 or 15 minutes when the orbiter's in the area. It was a fluke shower apparently that got that orbiter, but that 20 or 30 seconds in a light shower is 20 or 30 days on the ground of tile replacement, so that had a significant impact. That was a long time ago in the program, I can't even remember when that was.

Those kind of things are those unfathomable events that you run into in the program that just turn into problems, but we never had any unsafe transitions. We've never lost any aircraft nor endangered anybody on the runway with preparations that we've always accomplished first. Safety's always been the priority, and it's worked for us very well.

ROSS-NAZZAL: Have your procedures for accepting the arrival or departure of an SCA changed over the years?

FEILE: It's been pretty consistent. The progression has always been toward tweaking and improving, and there hasn't been much that needed to be done. Of course, we as the contractor had already had five or six of those already behind us, including the unique departure off White Sands, which was before our time. All of those were already in the bag by the time we got here. The process was already in place, and we, as the new contractor, just had to plug into what had already been revised by the time we got here. We just had to know what our role was, and that was an evolutionary process that we were able to accomplish as airport operators and eventually as air traffic controllers.

ROSS-NAZZAL: In 2001 there was a simultaneous ferry of the orbiters. Can you talk about that and any challenges that might have posed?

FEILE: That was rather unique I think, because it involved that additional element of complexity. Because it was wrapped around a launch, the program really got in a quandary as to where to put what, and it ended up that both of the Shuttle Carrier Aircraft ended up at the Cape Canaveral Skid Strip, not here, at one time. That was good because they had to sit and wait until we had a successful launch before they could jump nine miles and get here and start the process of getting them, [the orbiters], off.

All those things were going on, and we had to do some significant coordination for that. I remember that that was particularly intricate. I can't remember whether we had any delays in the launch, which would have just snowballed into more complex Shuttle carrier planning, but I remember it was a significant event. It was really quite a mess trying to make sure that everything got done for both in sequence. It involved more flight crews, more personnel, and certainly a more elaborate schedule for being ready to handle all of it.

ROSS-NAZZAL: Any funny stories about the SLF and SCA?

FEILE: Most of them involve the crews, ground crews and flight crews, more than they involve the actual aircraft handling. It was usually business priority here when we were doing those offloads.

I don't know if you've heard the story about the wrench—it's that other contractor that's actually handling the de-mating process. We merely provide them the opportunity to take care of that in the MDD. It's the United Space Alliance or Lockheed's operation to handle orbiters, and we keep track of how long it takes them sometimes and how that all works. They ran into a

situation where they had a Shuttle carrier come across country, and they got into the offloading process and realized that they didn't have one of the only two tools in existence that they needed. They were both at Edwards.

That quandary ended up with a deployment of a T-38 out of Houston to go get it, throw it in the pod, and bring it cross-country in order that they could resume the operation. That took almost a shift I think, so they actually went about a shift down in order to find a pilot to make that transition, 1,500 miles to get the wrench and 3,000 miles to bring it here before that operation could continue. So all of that planning kind of goes dormant, you might as well just sit and wait. That has happened on only one occasion.

Then the rest of the routines, everything is pretty much accomplished in advance. The Shuttle program is well documented in their step-by-step plans for getting everything done, from launches to landings to Shuttle carrier events. When they get it down to a science, they document it well and remain prepared for the next time it happens. I've been impressed by that from the start. There's been very few deviations from that or any unsafe condition or any real scheduling conflicts. There's a significant cost involved with the number of people that are involved in every operation, the amount of man hours that have gone into the planning for it, so they like to plan it down to the n^{th} degree as best they can in order to make sure it stays as economical as possible.

ROSS-NAZZAL: This is one of the last times that there will be a ferry of an orbiter out of this facility. What are you feelings as *Discovery* is getting ready to be mated to the plane and leave for Virginia?

FEILE: It's sad of course, to have the end come like that, but it's still exciting to be a part of it and involved with it, and I've enjoyed it for as long as I have. It's been really great. We know that there's another one behind this, and we may be involved. There's going to be flight coverage even for the *Atlantis* transition down the street to our Visitor Complex, so there's always going to be something in the offing. Other than that elemental sadness—there's always that, plus we're resigned to the fact that this program has ended and the next one is out there somewhere.

We have an option to have the next generation of manned vehicle have a rubber side down also. If it has a rubber side down they're going to need a runway to land on, so we know we'll be here. Even the hardware handling of the flight segments, those kind of things, there's always going to be something that's going to be necessary. I know that KSC is resigned to the fact that the runway is an important asset that they own, and that they intend to manage it as best they can and offer it up. With the commercial diversification that we've been into now, there's a lot of future here.

The Morpheus program is coming this summer. There are other customers that are out there that are interested in the place, and a lot of different diverse approaches have been offered up to NASA for the continued use of the runway in one form or another. Instead of one big bag of money that Shuttle provided, there seems to be a lot of smaller opportunities out there that, if managed correctly, will provide for the continuation of the runway operation. And not just for the aviation environment, but also for its unique characteristics. Because of its length and its location, it provides a great opportunity for a lot of programs. So I think the future is good for us. It will be sad to see the orbiters go, but it's part of the natural change.

ROSS-NAZZAL: Rebecca, do you have any questions for Ron?

WRIGHT: I don't think so. You've answered all the ones that I had, so thank you.

ROSS-NAZZAL: Is there anything that I may have overlooked or that you think we should talk about?

FEILE: No, I think we've covered most everything.

ROSS-NAZZAL: Well, we certainly thank you for your time and offering office space today. We appreciate that.

[End of interview]