Attachment 1

to Operational Factors / Human Performance Group Factual Report

DCA011IA047

INTERVIEW SUMMARIES

Interview Summaries

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Interview: David Johnston, First Officer – Southwest Airlines flight 1919
Date: May 5, 2011
Location: via telephone
Time: 1207 EDT

Present: Evan Byrne, David Helson - National Transportation Safety Board (NTSB); John Gadzinski – Southwest Airline Pilots Association; Keith Griffith – Southwest Airlines; Tom Phillips – Boeing; Bob Hendrickson – Federal Aviation Administration

First Officer (FO) Johnston was represented by Mr. Anthony Battista.

FO Johnston stated the following information:

His name was David Douglas Johnston and he was 50 years old. He was a first officer at Southwest Airlines (SWA). He was hired in July almost 10 years ago. He was based at BWI (Baltimore Washington International Airport) and has been flying on the 737 since 2002 when he got hired at SWA. He has been a first officer the entire time.

He got his Private Pilot Certificate from his father who was a retired USAF officer and a flight instructor. He worked outside aviation for a few years before pursuing aviation full time in 1985 and flew pipeline patrol in 1986 where he built up his hours and got his CFI (certified flight instructor) and commercial instrument rating. He worked for a nonprofit organization flying in Africa for a year in single engine piston aircraft. Then he came back to the United States and flew light twins, turboprops out of the Chicago area for about 4.5 years for DirectAir; a company which later bought the Midway Connection name after it went into bankruptcy. After DirectAir he did contract work flying Beech 1900's and King Air 350's overseas working for a guy who worked with Raytheon doing aircraft deliveries. He was hired by Midway Airlines out of RDU in 1997 and was with Midway until 9/11 at which time he was unemployed for a year before starting with SWA. He said he had logged about 17,000 hours total time. Since SWA he has been keeping a yearly logbook with his tax records. That number is approximate, and he estimated that he flew about 800 hours a year. He estimated that about 7,000 hours of his time was SIC (second in command) time on the 737.

He was asked to describe flight 1919 which originated in DEN. There were no jump seaters on that flight. They had a MEL they were carrying for a handle /furnishing but he could not recall exactly what it was. After departing DEN there were no maintenance issues that he recalls. Top of descent they had completed the ATIS (Automated Terminal Information Service) information and the briefing for RNP Z RWY 13C at MDW (Chicago Midway International Airport). He did not remember anything eventful at all. The next thing that happened was there was weather in the area slowing down arrivals and they were advised to expect holding. They received a holding assignment, and at that point they started checking on the weather at St Louis and Indianapolis, checking their distances which they saw were essentially the same. He believed the captain was checking the weather to make sure it was sufficient and there would be no surprises if they diverted. They then got a message from dispatch changing the alternate to MKE

(Milwaukee). Neither pilot was happy with MKE as it was going to require negotiating the weather to get there. They had a discussion about FAF (final approach fix) fuel. He could not remember the numbers specifically but thought it was 8,000 or 9,000 pounds. They were in holding about 25 minutes.

The captain was the flying pilot (PF). FO Johnston was the pilot monitoring (PM). In holding ATC said they were accepting arrivals for RNP (required navigation performance) approach only and an ILS (instrument landing system) would be an indefinite delay. Air Traffic Control (ATC) asked if they were capable and they said "yes". He believed ATC assigned the RNP Y approach which was different than they had briefed. They got the approach, set it up and briefed the changes for the approach. ATC gave them a descent to 2,500 feet going towards the airport. One of the last things he recalled from ATC was "170 knots, switch to tower at JUPIR". He did an OPC (On-board Performance Computer) calculation for WET-FAIR conditions. He believed he did the OPC calculation around that time but was not 100 percent sure, but he was sure he did the calculation though. He told the captain something to the effect that they still had a positive stopping margin, but was not sure he told him the actual number. He said he was not entirely clear on his verbiage but he knew that MAX was the only positive stopping margin available.

Continuing to JUPIR intersection they were starting to configure for landing. Landing gear down, flaps 15. He said the captain called for flaps 25 and he reached for the handle and started moving it when he noticed the airspeed bouncing around and exceeding 170 knots. Then he moved the handle back to flaps 15. He moved it out of the slot, to 25, then back to 15 and believes he said something about airspeed. When they got to the correct airspeed he went to flaps 25. Then the captain called for flaps 30. Then he moved to flaps 30 and he got a flap over speed; again on the edge and gusty conditions again. At flaps 30 the speed was trending down and he selected flaps 40.

At that point he realized they were past JUPIR and he had not called the tower. He called tower and got the landing clearance. After getting the landing clearance the captain asked him to query tower about the cell they saw over the field. They had seen it before on radar, and now were seeing it visually on the field. He asked tower about the weather and he believes the response was that it had past the field east moving north east. He did not recall his response to that because they had gusty winds and a rain cell they were concerned about. He said they were in visual conditions but still flying the RNP approach.

At 1,000 feet the captain called "approaching minimums". That threw him off because he did not agree. At that point he thought he set his bug wrong. He went back inside and checked his plate and made sure he had the right one up and right decision altitude. He looked at his side and made the comment "that's 1,000 feet not decision altitude". Then he made the call since, at that point, they were approaching minimums as the decision altitude was around 500 feet anyway. Captain called going outside, minimums, landing, which was standard phraseology. From that point to landing everything seemed to be in the slot and normal for the wind conditions.

Upon landing they were in the TDZ touchdown zone and there still seemed to be a lot of water on the runway. On touchdown he did not notice the deceleration rate that was ordinary. So he looked inside and saw the autobrake disarm light on, that surprised him, and he called it out.

When he called it the captain said he was on the brakes. Next he called thrust reversers because they were not deployed yet. He believed he said max. At this point he said the stress was increasing because they were not getting the stopping action they expected. He said they were not getting a significant stopping action. The captain (CA) deployed the TR's (thrust reversers) and he saw the CA on the TR's and the brakes. At that point the CA called for him to help on the brakes. He said he got on the brakes with the captain and there was no change in deceleration. At that point his mind was spinning with thoughts and he thought about going around. He said they had talked about the MDW overrun in training and you could go around until the TR's were deployed. But they were past that point so they could not go around. That was just what was he thinking, he did not verbalize that.

He said when he was looking at the CA on the brakes and TR's he noticed that the speed brake was not back. From there it seemed like a long time of just skating down the runway with little deceleration. The TR's were spooled up and he was trying to measure some sort of action where the airplane would grab the runway. At the very end of the runway he actually thought they had slowed enough to make the left turn and continue with the TR's engaged – he knew that was not standard but he thought that.

He said they ended up in the grass off the end of the left side of the runway. He said the airplane came to a pretty quick stop. The captain stowed the TR's. He thought the CA got on the PA right away and said remain in the seats so as not to have an emergency evacuation. Then FO Johnston said he called the tower with a brief statement that they were off the runway into the grass. He heard tower issue a go around to the aircraft behind them. The captain said he did not see any evidence of fire but to do a precautionary evacuation checklist. FO Johnston reached for the emergency electrical switch to battery, speed brake lever forward, flaps 40, and pressurization panel he thinks he started that but was not sure. From there he had a few choice words he thinks. Almost immediately upon landing there were ground crew from the terminal area that had come over – ramp tugs and stuff of that nature. He could not see anything off to the left in the taxi run-up area for 31C. There were men and equipment in front of his vision. The captain proceeded to check on the Flight attendants and passengers, there was no report of injuries at that point, and they called for air stairs to be brought out. They ended up evacuating everyone through air stairs out the aft door onto the taxi area.

He said they felt comfortable with the time they had and the fuel situation; 25 minutes in holding was not so much. Had they gone much beyond that they would have had to make a different decision. Fuel needed to get to an alternate was manageable.

Regarding the RNP approach change. They had to go back in the books and get out the plates, set up the FMC (Flight Management Computer), check the waypoints were correct, and reset the decision altitude. He said they did not use the RNP a lot. He said they hadn't landed 13C in a long time – he could not remember landing on it. It was normal but not comfortable – he was struggling for ways to describe it. It was out of the ordinary and not a daily routine for them. He had never done the RNP to 13C and he could not remember landing on 13C since he was flying turboprops. It was an unusual configuration for MDW.

He said he was familiar with MDW, it had constraints that most other airports did not have. An ILS to 200 and ½ was kind of standard, but they had an approach to 4R having greater than 3 degree slope. He said MDW was a unique airport.

FO Johnston said they had to make changes in the FMC because they were assigned 2,500 but the approach had a mandatory altitude of 4,000 that had to be changed to allow the airplane to go down. The captain took care of it without problem as they did go down to 2,500 feet. The place where he thought the workload increased was holding 170 knots to JUPIR and the fact he had to work so hard to get the flaps down and they over sped the flaps. He said he would call that a problem. He said ordinarily when he was asked to contact tower at a certain point he would be on frequency a few miles before the point. The fact he was beyond JUPIR before contacting tower indicates to him his workload had distracted him from that.

He could not think of any issues setting up the FD (flight director) modes. Something that could be distracting was the fact they were coming through the bases of the clouds and they were directing their attention outside visually. The strict discipline of staying inside was interfered with.

Normally they would not accept more than 170 up to 5 miles out. JUPIR was a bit more than 5 miles out and he thought their configuration was flaps 5. Given the gusts he thought the speed assigned did interfere with their normal operation.

He said the captain was using the AP (auto pilot) for the approach.

Landing ordinarily was at flaps 30. After calling for flaps 30, they would set ref or target. That was the ordinary time to call for the before landing checklist; with the final flaps setting. The pilot flying would call for the checklist – final flaps, set target, and then called for the landing checklist. He tried to recall by working his sequence from the end of the runway back but he could not remember the captain calling for the before landing checklist or him offering the before landing checklist to the captain. The checklist was challenge response type.

They normally used autothrottles and did on this approach. Normally on an RNP approach, the automation would fly the aircraft to the DA (decision altitude) at which point the pilot flying would turn off the autopilot and autothrottles to land. On this day he was not exactly sure when the pilot flying turned off the autopilot.

He thought that at the captain's 1,000 foot call the airplane still had autopilot and autothrottle engaged. He did not know when the captain turned off the AP and autothrottles. He said you would not use the autothrottles and AP for landing but you still have the flight path on your PFD (primary flight display) available for use.

He said they actually transitioned to visual very early on. But from DA to touchdown you have your MASI (Mach / Airspeed Indicator) speeds on the inside to reference airspeed. He said the PM was supposed to call deviations of 5 knots below and 10 knots above ref speed. He said the flight path was indicated by the RNP approach and if you had outside indicators you would use those. He said the company FOM (Flight Operations Manual) had guidance indicating you could

tune and use the corresponding ILS information as backup. He knew they tuned it but did not remember selecting it.

He did not recall the airspeed target but remembered having a gust factor that was high. He said they were allowed to correct up to 20 knots; that was their limit. He recalled adding a correction in on this one and said he recalled doing the numbers but can't remember what they were.

He thought they touched down about 1,000 feet from the end of the runway. He based that determination on the painted runway markings.

FO Johnston said "autobrake disarmed" was a normal call that he would make but he was surprised that it was off so early this time. The rest of the calls were exception calls that were made only if something was not happening. He recalled calling the thrust reversers as they were not out and at that point he was relatively sure he said "max" because he was dissatisfied with the braking and traction performance and he wanted everything that they could get. If they were not automatically deployed he was supposed to call "speed brake". He did not remember calling it. The captain asked him to assist with the braking and that's where he was not clear – he did not think he called it.

He said if the speed brake did not automatically deploy then manual use was required. To arm it you lift it over the detent, about a half inch lift and quarter inch back from the fully stowed/forward position. You also get a speed brake green light. He said that was part of the before landing checklist. He said he did not manually deploy the speed brake and did not know if the CA manually deployed the speed brake. When he did his precautionary flow after they came to a stop the handle was forward. He was not sure if the captain had moved it forward.

He said normally at touchdown you would immediately go to reverse thrust. The detent that was used was dictated by the conditions; he said detent 2 was normal. He said it was kind of a motor memory thing and you had to be at idle to deploy them. He said he could not speak to whether they had difficulty deploying the thrust reversers on this flight – he just made his call.

FO Johnston said he thought they might be able to make the turn at the end of the runway but he could not speak to the directional controllability because he did not touch the nose wheel steering.

Regarding OPC data, he said he input the ATIS (automated terminal information service) weather; winds, temperature, altimeter, and the runway conditions. They had initially run it with WET GOOD and then he ran it with WET FAIR after the fair braking report. He did not remember exactly when they got that change. He said they usually get the reports with tower which was the worst time to run data. He thought he did it before that which would have been with approach control.

He said the OPC gave you a braking margin. He said Southwest Airlines did not use autobrake 1 but used autobrake 2, 3, and max. He said it took into consideration the winds, the contamination, and it gave you the braking margin at those settings. He said 2 and 3 were negative or not acceptable in this case. Max was the only acceptable positive margin for the

conditions as reported. If the conditions were different than the report then the report was no good. Based off of the wet fair data, he thought that WET POOR would have been unacceptable. He said he tried that out in the OPC after landing as that is what he felt the stopping conditions were at the time, and it showed that and the if the conditions were poor the data did not support their landing. He had not felt that kind of stopping traction on a wet runway before.

He said some of the assumptions included in the OPC were that the autobrakes were mandatory, touchdown was predicated on 1,000 feet, and he believed there was a 15% margin added for less than optimal performance on the crew's part. The landing weight was calculated without the holding. So they landed lighter than calculated on the OPC. He said when asked that spoilers and thrust reversers were included in the OPC assumptions but he was not 100 percent sure. He said he thought it was predicated on the autobrake system working and normal deployment of thrust reversers and spoilers.

Not sure of specific guidance for the situation where they get a change to conditions on short final but they were required to always operate within the parameters. If you got a different wind report it would change the landing data, and to figure out how it would change it would be difficult without going around and recalculating in the OPC.

He said they did not discuss the EMAS (engineered materials arresting system) although he was aware of it. He could not think of any guidance they received on using it. He was aware it was in place at this runway on both ends and was aware of what its purpose was.

FO Johnston said he did his initial 737 training at Midway airlines just before they went into bankruptcy. He got a type rating at Midway then the next week he could not hold the seat and he went back to a regional jet.

He said his last event at SWA was in June of 2010 and it was a PT (proficiency training). He said they received the OPC training at SWA.

Regarding the RNP training, he said it was a step process and last year in June was his Step 4 training. They had to do 6 practice approaches prior to Step 4, 3 as pilot monitoring and 3 as pilot flying. Step 4 training allowed them to fly the RNP approaches. He said there was a day of ground school and a day of flight training. Before the event he remembers flying with a captain and mentioned he had not flown RNP much and since he was having a check ride coming up in June, they requested one into BWI. That was a couple weeks before the event. He had difficulty estimating the number of RNP approaches he had flown or monitored since his training.

Regarding workload, he described it as higher than normal. The reason was that the winds and weather definitely brought in significant distractions to monitoring normal aircraft procedures. He said that it is more challenging monitoring during visual approaches as compared to approaches in IMC (instrument meteorological conditions) conditions because you have the extra distraction of the outside view to contend with. On hard IFR (instrument flight rules) approaches there is nothing to see so you always stay focused inside.
The first call he made was autobrake disarm. The captain responded saying he was on the brakes. Regarding the timing of his calls, he said the autobrake disarm light caught him off

guard. He was anticipating it to stay armed. He said that call was normally made as you were slowing to taxi speed. He did not know why the thrust reverser call was delayed. He said he did not have a normal flow he used after touchdown to check the spoilers and thrust reversers.

He did notice the speed brake handle in the forward position when he made the thrust reverser call. He said he was in a position to pull it aft if he had reached under the captain's hands. He did not know why he did not call out speed brake or pull it aft himself. Thinking back he said he was surprised by several things and was trying to be sequential to be sure he covered the braking and TR. He also remembered the captain asked him to assist in braking. He understood the speed brake call needed to be made if it was not deployed.

He said the pilot flying verbalizes when the autopilot and autothrottles were selected off. He said the pilot monitoring just verified it but did not need to verbalize a confirmation.

FO Johnston said he had flown with the captain before, earlier this month. The first of the month, he flew a 3-day trip with him. The second week the captain had an IOE (initial operating experience) to do so FO Johnston only had a day and a half with him. Before this month he had flown with him a year or two ago. He described the captain as standard and what he saw on the line all the time. He said SWA has a great group of aviators that performed well.

He said he had no previous accidents but did have a situation in which a hydraulic line failed from a tire that blew on takeoff and he landed with a flat tire. He recalled that had occurred in his first year at SWA. He said he had failed a checkride at Midway but had not had any training or checking difficulties at SWA, nor had he any checkride failures before Midway. He said he had not had any DUI's or any significant accidents or incidents while driving except that he had backed into a car in a parking lot a few years prior.

The first officer had difficulty recalling his specific activities in the days before the event and said answers to these questions would only be estimates. He said that he went to sleep about 2230-2300 on Friday 4/22. He stated that he awoke on Saturday 4/23 at about 0800 and got about 8-8.5 hours of sleep that night. He reported doing routine activities around home but could not recall any specifics except that he recalled throwing a ball and riding a bike with his son. He said he had also been putting a muffler on a car and his wife called and said they were invited to a friend's house for dinner. He did not take any naps that day, and he and his family had dinner at the friend's house that evening where he had a few glasses of wine. He went to bed about 2300-2330. On Sunday 4/24 he woke about 0700 and reported getting about 8 hours of sleep. He said his sleep was normal quality with no awakenings. He reported going to church and routine activities around the house. He did not recall doing any exercise, did not take any naps, and went to sleep about 2200-2300. On Monday 4/25 he awoke about 0700-0730 and reported getting about 8 hours of sleep. He said his sleep was of normal quality with no awakenings. He reported routine activities around the house. About 1900 he departed RDU for BWI. He went to sleep at his crash pad about 2300. On Tuesday 4/26 he awoke about 0405 and reported getting about 5 hours of sleep. He described the quality of his sleep as "fine". At 0430 he left the crash pad and went to the airport which was about 10 minutes away. His report time at the airport was 0515.

He stated he was in good health on the day of the event and in the preceding 3 days. He reported taking no medications, prescription or non prescription that could have affected his performance. He said he took Synthroid every day, which he had reported on his FAA medical.

He stated the flight from BWI to MDW was uneventful and he had breakfast at MDW. He said he was the flying pilot on the next leg from MDW to DEN, which he said was uneventful. The next leg was the incident flight from DEN to MDW which was uneventful up to the top of descent.

He characterized his activities in the days before the event as not unusual. He said he slept OK and had no recall of waking up at night or anything out of the ordinary. He said he normally woke up about 0700 and went to sleep about 2300. When asked how many hours of sleep he typically needed to feel wide awake and alert throughout the day he was unable to provide a specific number. He said that sometimes he got more sleep than he needed. He said he sometimes just felt lazy and stayed in bed because he was the only one awake in the house. He said 7 hours of sleep is fine for him, but he functioned OK with less.

The first officer lived in the Raleigh Durham area. He reported living with his wife, two sons, and a daughter (aged from 12-17). He was dealing with a health problem involving his older son and other issues including the death of his oldest son in August a couple years ago. He said it was fair to characterize his personal situation as somewhat stressful.

He reported having no sleep disorders, or conditions which affected his ability to obtain sleep and he said he had no difficulty staying awake during the day.

The first officer reported that he used corrective lenses for distant vision and his color vision was normal. He said his hearing was OK. He drank alcohol occasionally, most recently on Saturday evening.

He was asked to explain what he meant by the captain's nonstandard callout at 1,000 feet. He said normally the pilot flying called out airspeed and sink rate, at 1,000 feet – it was a situation call. The captain called approaching minimums at 1,000 feet and FO Johnston did not immediately correct him. His first thought was if he had set his own bug correctly. He checked that and it took a little time so the 1,000 foot call was missed. He said the 500 foot call coincided with approaching minimums call.

He reported that his personal situation although stressful did not affect his performance during the approach and landing. He also stated that he did not think that anything affected his performance during the approach and landing other than the timing of the distractions that he previously discussed.

BREAK

Regarding the OPC data, FO Johnston said he did not know if there was a 15 percent margin included in the rejected takeoff data but believed the 15 percent margin built in to all the

calculated distances. He stated that based on his experience, he thought the OPC numbers were conservative.

He said he thought the auto brake max setting was an overly conservative method of stopping and that some people would use manual braking instead. He said he had used max on dry runway and he would get on the brakes before the autobrakes activated and modulate it down.

He had not been given instruction on how to give a braking action report and had not been given any simulator training on the subject. He said there was no indication of braking performance available to the pilot on the 737 and no caution or warning system advising when braking was less than good.

He said he did not think it was raining at the time they touched down on the runway and did not think they were operating the windshield wipers at the time.

He did not recall being given any speed restrictions when conducting RNP approaches during training.

He could not recall a time when the speed brake had not auto deployed on landing and he could not recall ever having a scenario in training where the speed brake or thrust reversers did not deploy.

Regarding the EMAS, he said he did not normally include that in his approach briefings.

FO Johnston recalled that the stopping margin number given by the OPC was 210 feet. He said the standard procedure was to run the numbers, evaluate them, and give them to the captain to evaluate. He did run the numbers but did not remember if he gave them to the captain to look at.

He was asked if there was another way for the flying pilot to know it would be a “critical” landing performance wise, and he said that would be indicated by using max brakes.

He was not sure how long after touch down the auto brakes disarmed. He was looking out monitoring touchdown, lack of deceleration brought him inside, and that was when he made his first call, “autobrake disarmed”. He estimated it was 2 or 3 seconds.

He said both pilots were supposed to make a call at 1,000 feet. He said the distraction was because it was the wrong call. He verified it was incorrect, and then he came back and advised that it was 1,000 feet, not minimums. He said he was not sure if the PF was supposed to make the call if the PM had failed to make the call.

He said that, based on his experience at MDW, it was unusual for ATC to advise that there were lengthy delays if you wanted an ILS instead of an RNP approach, but he did not remember discussing that with the captain.

He said it was rare for the captain to call for flaps when he was over speed.

FO Johnston said he was not sure if the captain asked him to help on the brakes before, or after he noticed the thrust reversers were not deployed.

He did not recall if the ATIS had advised that an RNP approach was in use. He said they briefed the RNP Z then later got the RNP Y. He said it was not an error on their part, it was changed.

He did not think either of them made an airspeed callout at the 1,000 foot point.

He said he normally saw guys get on the brakes early when using autobrakes max but this disarm seemed quicker than he normally saw. The surprise was really no grab. At that point he wanted to monitor all inputs to make sure what he knew should be done was being done. He did not think there was a failure of the autobrake system. Normally takes a second or two to get the nose down.

When asked if he thought there was anything he would do differently, he said the distractions were a problem and he wished he had handled them better.

Interview ended at 1525.

Interview: Michael Navarro, Captain – Southwest Airlines Flight 1919
Date: May 5, 2011
Location: via telephone
Time: 1540 EDT

Present: Evan Byrne, David Helson - National Transportation Safety Board (NTSB); John Gadzinski – Southwest Airlines Pilots Association (SWAPA); Keith Griffith – Southwest Airlines; Tom Phillips – Boeing; Bob Hendrickson – Federal Aviation Administration

Captain Navarro was represented by Mr. Anthony Battista.

Captain Navarro exercised his right to exclude the SWAPA group member from the interview, and Mr. Gadzinski left the room.

Captain (CA) Navarro stated the following information:

His name was Michael Anthony Navarro and he was 50 years old. He was employed by Southwest Airlines as a CA on the 737 and was hired by Southwest Airlines on January 21, 1993. He said that he also held the position of check airman at Southwest Airlines until the afternoon of this interview. He stated that he had just received a letter advising him that he was no longer a check airman.

CA Navarro stated that he started flying at the age of 19. He attended a private flight school in Colorado where he had obtained his commercial and instrument pilot certificates. He had low hours but built his flight time while working at an oil company. He joined the Air Force as enlisted personnel for about five years and then was accepted to US Air Force pilot training in 1985 and graduated in 1986. He was assigned as an instructor pilot at Vance Air Force Base for about four years. He was then assigned to fly C-130s in the Pacific at Yakota airbase until he separated from the U.S. Air Force in January 1992. He said he applied to airlines, was interviewed by Southwest Airlines and hired in 1993 after about a one-year break after separating from the Air Force. He estimated that he had logged approximately 10,500 hours total time, about 7,000 hours of that was pilot in command time. He stated that he had logged about 7,000 hours total time on the 737 aircraft. He had upgraded after about three years at Southwest and estimated that 5,000 hours of that time was pilot in command time on the 737. He said that in addition to a 737 type rating he also had an L-382 type rating, which was the civilian version of the C-130.

CA Navarro stated that on the day of the event they departed Denver on flight 1919. He recalled that there was possibly one MEL item listed for nonessential furnishing equipment which he thought might have been a cargo door spring. He said the flight was uneventful up until the top of descent. He said approaching the Chicago area and commencing the descent there was some talk on the radio of holding. He said they were given a descent and hold at the SARMS intersection. He said they loaded that in the FMC (Flight Management Computer) and had a few more step down altitudes and entered the hold with an EFC (expect further clearance) time of about 1815Z (Zulu). He said they entered the hold and advised dispatch via ACARS (Aircraft Communications Addressing and Recording System). It was a standard holding pattern right turn with 10 mile legs and there was another aircraft below he thought was a corporate aircraft which they saw occasionally in and out of the clouds. He said they began looking at fuel and considering alternates. He said they were considering either Saint Louis or Indianapolis as alternates depending upon which side of the airport they were on at the time they needed to divert. He said dispatch sent an ACARS message advising them to look at Milwaukee (MKE) and use a 1,500 pound fuel burn. He said he and the first officer (FO) discussed options and were not comfortable with 1,500 fuel burn to MKE due to the weather. He said they decided they would leave the fix to go to the alternate with no less than 8,800 pounds of fuel. He said they did a few more turns in the holding pattern and they started to hear air traffic control asking folks about RNP (required navigation performance) approaches. He said ATC advised that they would start letting flights into MDW if they could accept RNP approaches. He said they advised ATC (Air traffic Control) that they were RNP capable. He said they heard ATC release the aircraft below from the hold. And they were released from the hold, given a descent clearance and cleared direct Joliet (JOT). They were in VMC (visual meteorological conditions) but he said there was a cell at their 12 o'clock position they had to deviate around to the left. They were also advised to expect RNP Y approach and they had previously briefed the RNP Z approach. He said they were assigned airspeed of 170 knots and given a descent to 2,500 feet. After they cleared the cell they proceeded direct to JOT. He noticed that on the FO's weather radar screen there was a cell over the airport; a very defined, red cell formation that concerned him. He said that he asked the FO to contact ATC to determine the movement of that cell. ATC advised that the cell was east of the runway and moving east.

CA Navarro stated that they had to prepare for the new approach, the RNP Y. He said they had to get the approach plates out, load the approach in the FMC, and check it. There was a mandatory altitude of 4,000 listed at TOYUL intersection but they had been given 2,500 feet. He thought that was interesting but since they were under radar control, deleted it on the legs page of the FMC. He stated that at some point they heard an aircraft that had reported braking action "fair", which caught his attention. He said the FO used the OPC (On-board Performance Computer) to re-evaluate the data with fair braking action.

CA Navarro said he was the pilot flying (PF) and was flying with the autopilot on using LNAV\VNAV (lateral navigation / vertical navigation) with speed intervention to maintain the speed assigned by ATC. He stated that he mentioned to the first officer that he had never done this approach at MDW, especially to runway 13C. He said they were in visual conditions, that he could see MDW and he noted their proximity to O'Hare airport and understood why they were flying this approach. He stated that the FO advised that they still had a positive stopping margin using maximum reverse thrust. He set the MCP (mode control panel) altitude window at zero, and maintained 170 knots. He said he had perceived the speed clearance to mean he should maintain that speed to a 5 mile final, which was as close in as company guidance allowed.

He said the aircraft was proceeding on course starting to turn inbound but he was mostly looking outside. He said they started to configure with gear and flaps but were bumping up against the 170 knot speed restriction at 5 miles. As the aircraft started to decelerate the called for flaps 25 but with the gusty winds the FO said they over sped the flaps. He recalled that he pulled the throttles back at that time and also reselected or reconfirmed the VNAV path; he thought that might have been an issue for the airplane slowing down. The FO then selected flaps 25 and the captain called for flaps 30 and flaps 40. He said the aircraft was being buffeted around quite a bit, there was quite a bit of cross wind but they were still tracking the centerline and vertical path. FO said again that they may have a possible over speed. The FO was moving the flap handle in and out of position to make sure they didn't have a potential over speed. CA Navarro stated that he was mainly looking outside now. He said Midway was difficult airport to land at and he wanted to make sure they met the stabilized approach criteria.

He said he was dividing his scan outside and inside the aircraft. He made, what he knows now, was an incorrect call at about 1000 feet. He said he saw the white line on the altitude display and called "approaching minimums" but the FO corrected him and advised it was the 1000 foot call. He recalled that he disconnected the autopilot and auto throttles at this time and continued to fly the approach manual. Believed he heard the approaching minimums call but does not recall if he replied. There was no impediment to visibility and he was looking outside as required by company procedures. He was focused on maintaining a proper glide path, which was normal, but the airspeed was buffeting and they were bumping close to the flaps 40 speed. He said there was a 500 foot call and he would normally perform a scan inside at that point and then continue the approach. On this approach, the 500 foot call was replaced by the minimums call because they occurred at about the same altitude.

CA Navarro said they touched down within the first 1000 feet of the runway. He said he had landed here many times and it was very important to land in the touchdown zone so he was concentrating on that. He touched down and everything seemed like a normal landing and

touchdown until then. He said normally he would feel the aircraft sit on the runway and start to decelerate. He did not feel that this time so he was taken by surprise. He instinctively applied maximum brakes. He did not recall if the speed brake deployed or if he even checked. He heard the FO say "auto brake disarmed", and he replied "yeah I'm on the brakes". He said he was not feeling any normal deceleration of the aircraft. He was trying to use manual maximum braking and was pressing as hard as he could. About that time, the FO said "thrust reversers". He said he had to move his hand to the thrust levers and deploy the thrust reversers at that time. He said he deployed thrust reversers to Max, was using maximum braking, and trying to stay aligned on the runway. He finally started to feel some deceleration but anticipated that they wouldn't have enough room to stop. He saw a holding area to the left side of the end of the runway and attempted to clear the runway off to the left. He said at this point they were on the last 1,000 feet of the runway, where it was slippery, and the aircraft did not seem to be responding. He was trying to be careful to avoid any side loading damage so once he realized they were going into the grass, he straightened out the tiller and rolled about 50 feet into the grass.

He stated that once they exited the runway he could see and hear the thrust reversers kicking up water and grass so he stowed the thrust reversers (TR) and shut the aircraft off. He confirmed that they were stopped and that the engines were shutting down. He stated that there was no indication of fire or damage and people on the ground were responding quickly. He recalled that he may have opened the flight deck window to talk to them. He wanted to make sure the passengers did not start evacuating as that could cause some unneeded injuries or problems. He used the PA (public address) to advise the passengers to remain seated. As a precaution they did the evacuation checklist, and then he checked on the cabin crew and passengers. He opened the flight deck door and the flight attendants disarmed the cabin doors. Passengers remained seated; no one was agitated or excited. He was talking to ground personnel and crash fire rescue personnel concerning the use of air stairs. They discussed the instability of the air stairs in the mud so they decided to use only the aft exit after they stabilized the stairs. Once they brought the air stairs up he went down to talk to crash fire rescue personnel. They decided it was okay to let passengers remove their belongings and exit the aircraft. He said they arranged for buses to come pick up the passengers and he went back upstairs and reentered the aircraft. He said the passengers were doing great so he talked to the flight attendants and then went back up front with the FO. He said he was upset as he did not understand what had just happened. He talked to maintenance personnel and they advised him to shut the aircraft down completely. He recalled that they had started the APU (auxiliary power unit) to keep things as normal as possible, since this was not an emergency evacuation. He stated that he and the FO cleaned up their approach charts and personal belongings then exited the aircraft. He said that CFR had him sign some type of medical release form stating that medical assistance was not needed at this time. He said the Chief Pilot (Tony Dorsch), and the Assistant Chief Pilot (Art George) of the Chicago base met them and took them by van to a conference room at the airport pilot lounge.

CA Navarro stated that he had never flown the RNP Y 13C approach, that he had been flying into MDW for 18 years and had rarely landed on runway 13C, he said maybe two or three times. He said there were no concerns with setting up or briefing of the approach. He said normally they would begin configuring the aircraft 3 miles before the final approach fix. He said having to fly 170 knots delayed the configuration and caused a little bit of the time compression as he was trying to get the aircraft slowed. He believed that they did not meet the parameters for being

fully configured by the final approach fix (FAF) but thought they had met the stabilized approach criteria by the time they reached the 1,000 foot point, being fully configured, on speed and on glide path. He said they were in visual conditions for the whole approach and his attention was focused outside more than inside. When he had scanned back inside he looked at the PFD and saw a white line coming up on the altitude reference which he mistook to be the minimums they had set for the approach. He said the minimums line would have been green.

He said normally on approach they would be fully configured by the final approach fix or glide path intercept. The pilot flying asked for final flaps and that would be the key to run the before landing checklist. It was a three item checklist that was a challenge response type of checklist which they used prior to every landing. Then on the approach the pilot flying would cross check the glide path intercept altitude and call the crossing altitude at the FAF. He would call the altitude "2,400", for example and the first officer would say "cross checked". Then the next call out would be where the PF would call out 1,000 feet, the airspeed, and sink rate. The PM (pilot monitoring) would respond by saying "one thousand". Continuing on, the next call would be "approaching minimums" by the PM. The PF would advise he was going outside, then the PM would call "minimums" and the PF would say either "landing" or "go around". There was also a 500 foot call but it was interchangeable with the approaching minimums call if they occurred at about the same point on the approach. Depending on the airplane either the PM would make altitude calls from 100 feet down to 10 feet, or the airplane would make automated callouts.

CA Navarro stated that he would normally disconnect the autopilot and auto throttle after the approaching minimums call, and he recalled that he had disconnected them when he mistakenly made that call back at 1,000 feet. From minimums to touchdown he was scanning mostly outside looking at the PAPI (precision Approach Path Indicator) and also scanning back inside. He recalled checking the VNAV path indicator and it showed them to be on path. He said he thought they had a pretty high REF speed, that the speed was bouncing around in the high 140’s and that at touchdown the speed was about 135 knots.

He said he expected to hear from the PM on rollout a call that the “auto brake disarmed” and "60 knots" call but he was not expecting to hear anything else unless something was not correct. If there was a failure of the speed brake to deploy or if the thrust reversers did not deploy in a timely fashion, the PM would call that out, or before thrust reverser deployment, he could call for a go around. He said he heard the FO make the thrust reverser call, at which point he deployed them. He could not recall how long after touch down he heard the thrust reverser call but said it was after he was already on the brakes. He recalled that he was on the brakes pretty quick. He said he did not use the speed brake on approach as they have a restriction and do not use the speed brake in flight once the flaps are extended.

CA Navarro said he was starting to sense that the aircraft was beginning to slow and he thought there was a possibility that he would be able to steer the aircraft by the time they reached the end of the runway. He was aware that in MDW had installed EMAS (engineered materials arresting system) after the previous incident there. He did not recall much talk about the system after that. He thought there were bulletins in the FOM (Flight Operations Manual) or a Read Before Fly regarding the EMAS but he did not recall any specific guidance on how to use it; nobody wants

to use the EMAS. He said he was not trying to avoid the EMAS, he thought he had the ability to turn the aircraft at the end of the runway.

CA Navarro said they heard a braking action report on the radio which they believed had come from an airplane rolling out ahead of them. He said they heard "fair braking" on the radio and that definitely piqued their interest.

Regarding the requirements for using OPC data, he said when you were using flaps 40, maximum auto brakes, with braking action fair, you knew it would require maximum reverse thrust. The crosswind would be limited to 15 knots and the data was predicated on timely application of the speed brake, auto brake, and reverse thrust for the data to be valid. He said when you input "fair" braking in the calculation; the OPC would indicate that maximum reverse was required. CA Navarro said this information was taught to pilots in training at Southwest Airlines.

He stated that when you begin to configure the aircraft, the first time you extend the flaps, the speed brake handle should be raised to the armed position and you would get a green light indicating the speed brake was armed. It was a standard PF flow but he said the captains usually armed it, because it was on their side on the throttle quadrant, and it was the captains' routine that the minute the flaps came out the speed brake was armed. He said it was then confirmed on the before landing checklist.

CA Navarro said he received his initial 737 training in Dallas, TX at a place called ACT, where he obtained a type rating on a 737-200. He said his last training event at Southwest was a recurrent check in November. He said he received some additional training for RNP approaches at that time. He said he was scheduled for a PT (procedures training) event this week. He said he had not done as many RNP approaches as he would have liked but the training had been going on for some time now.

He stated that at Southwest airlines, the standard automation they had been using was the Autopilot (AP) and Flight Director (FD), and then the company transitioned to using LNAV, and in the last few years they had jumped into using VNAV mode. He said they had basically been introducing one step of automation at a time to allow pilots time to get accustomed to it. He said they used to have a floor of 10,000 feet to use VNAV but now they were doing RNP approaches and all of the pilots had been trained on it in PT's and in PC's (proficiency check).

He stated that there was a brake system pressure gauge on the airplane but there was no indication of the pressure that was applied to the brakes.

CA Navarro said he had not had any unsatisfactory training events at Southwest but he did have one in undergraduate USAF training on a simulator event and one on a T38 contact ride.

He said that he had not been given any training yet, as a result of this event.

CA Navarro said he had not any accident or incidents in aviation and regarding his driving record, he said he had been involved in one “fender bender”, had received a warning for speeding once, and did not have any DUI’s. He said he did not do any flying outside of work.

CA Navarro said the workload went from routine to intensive on the approach. He stated that the primary factor started with the change of approach, and then the airspeed restriction. Weather indicating on the radar, and the report of fair braking action were definitely also a distraction.

He said that he had flown with FO Johnston before; about one year previously, and also on a trip earlier this month. He said he thought FO Johnston was “a good FO, conscientious, quiet, but did a good job”. He said his greatest strength was that he was very patient and methodical and that if there were any area for improvement it would be talking louder.

He did not know of anything that could have adversely affected the FO’s performance. He said the FO was “quite busy” re-computing OPC data and that CA Navarro had directed him to call on the radio to check the movement of the cell over the airport.

Regarding the OPC data, he said he knew when it called for max braking and max reverse thrust that it was a critical landing event, that there were stopping margin issues, controllability issues, and traction issues when there was wet-fair conditions. He said every landing at MDW was at the front of his mind. He said when he heard that there were crosswinds or fair braking, it really got his interest.

CA Navarro said after touch down, he did not sense the normal reaction from the airplane which led him to get on the brakes, which then led the FO to make the thrust reverser call. He said he did not know why the landing check did not get completed.

CA Navarro said that on the Saturday before the event, he awoke at about 0800 had breakfast, a light lunch, and had dinner that evening. He said his activity that day was routine and he had done some cardio exercise for about 45 minutes. He said he did not drink coffee but drank 1 or 2 Diet Pepsi’s that day which was normal. He did not drink any alcohol and did smoke some cigarettes. He characterized himself as a light smoker which he defined as smoking about one pack of cigarettes every three to four days. He said he took some recently prescribed hormone medication daily. He said there was nothing unusual about his health that day, that he did not take a nap, and went to bed about 2300 on Saturday night.

He said on Sunday he woke up about 0800, said he slept about 7 to 8 hours, and described the quality of his sleep as “good”. He did not recall if he had awakened during the night but said he may have gotten up to use the bathroom. He spent the morning helping his wife prepare for brunch as they had some guests coming over. He said he had a good meal and he drank a few glasses of champagne, and a few glasses of wine. He said he may have had a few extra cigarettes that day. He took his daily prescription medication, did not exercise or take a nap on Sunday, and there was nothing remarkable about his health. He went to bed about 2230-2300, which he said was normal.

He said that on Monday he awoke at about 0700-0730, that he had slept about 7 to 7.5 hours, and that the quality of his sleep was "good" with no awakenings that he could recall. He said his meals that day were normal, breakfast, light lunch, dinner, and his normal amount of caffeine. He said his activity was routine, ran some errands and spent some time at the garden center planning landscaping projects. He said he lifted weights for about 45 minutes and did some cardio exercise for about 30 minutes. He said he took his daily prescription medication, smoked a little less than usual, did not have any alcohol or take any naps, and that there was nothing remarkable about his health that day. He said he watched TV in the evening, packed for his trip, and went to bed about 2100-2130. He said he slept in a separate room from his wife the day before an early trip so he did not wake her up in the morning.

He said on Tuesday he woke up to his alarm clock at 0315, got about 5.5-6 hours sleep, and the quality of his sleep was good with no awakenings. He said he took a shower and grabbed some fruit and a protein shake, which he consumed on the way to work. He said he had about a 1 hour 10 minute drive to the airport. He did not recall what time he arrived but said it was prior to his scheduled check in time.

CA Navarro said the first leg of the trip was from BWI to MDW and was uneventful, he was the PF, and there was nothing remarkable about the flight or the FO's performance. He said the second leg was from MDW to DEN, was uneventful, the FO was the PF and there was nothing remarkable about the flight or the FO's performance. He recalled that the FO may have picked up some breakfast in MDW and ate it on the flight. The next leg was the incident flight from DEN to MDW and was uneventful up until the top of descent.

CA Navarro said there was nothing that affected his quality of sleep in the days prior to the incident; his activity had been routine and he normally went to bed about 2300 and woke up about 0700. He said he normally needed about 6-7 hours of sleep to feel rested. He said he lived with his wife and their children had moved out of the house. No remarkable changes in recent days. He said his health was good and that he had lost about 20-25 pounds in the last year, he and his wife had been going to a personal trainer together for the past 12-18 months.

He said he had not been diagnosed with, nor did he believe he had any problem associated with sleep apnea, insomnia, falling asleep, difficulty staying asleep, restless legs syndrome, pain or indigestion keeping him awake, or staying awake during the day. He said he sometimes woke up at night to use the bathroom and estimated that occurred once per night or every other night. He said his vision, color vision, and his hearing were good. He took a vitamin supplement and characterized his alcohol consumption as occasional or social. He said he did not take any medications that may have affected his performance. He said there had not been any change in his finances or personal life in recent months nor had there been health issues or death of a family member recently.

CA Navarro said there was nothing he could think of that would have adversely affected his performance.

Regarding the 170 speed restriction assigned by ATC, he stated that in his opinion, flight crew members at Southwest Airlines adopted a "can do" attitude and would try to comply with ATC

requests even when it might be a bad idea. He recalled that ATC had initially advised them only to expect an RNP approach but did not specify which approach. He could not recall why they initially briefed and set up for the RNAV (GPS) Z approach instead of the RNAV (RNP) Y approach.

CA Navarro said he was accustomed to doing a flow which checks for 5 green lights at the "500" foot call on approach but since that coincided with the minimums call; he did not do it on this approach.

He stated that his change in Check Airman status was not his decision, that he had received a letter from the Dallas POI (Principle Operations Inspector) stating that it was standard procedure to remove the check airman status when one was involved in an investigation.

He said that if the PM missed the "approaching minimums" call he would, as the PF, make the call. He did not think the thrust reverser activation seemed normal. He said they normally configured the airplane, gear and flaps down, when approaching the glide path intercept, and called for the before landing check after the final flap setting.

CA Navarro thought the reason the speed brakes did not get armed started back at the issuance of the RNP Y approach. He said the approach change combined with the altitude assignment different than depicted on approach, the speed restriction, and the lack of experience on his behalf with RNP approaches as well as the possible misapplication of automation usage, such as LNAV, VNAV, and speed intervention. He said it was a time compression issue thinking of all the things like wind and braking going into MDW causing distractions and resulting in them missing normal cues that they usually look for.

He said he thought it would be beneficial to teach pilots to get the books out and take apart the whole RNP process. He said it was a completely different animal and a different type of flying than they were all used to. He said even though it is in the books, he felt they did not do enough training on braking performance and what it means to have fair conditions and have maximum braking required. He said he used to give PC's and there were not a lot of check airman that gave a crew a scenario where there was a landing in fair conditions then fail a spoiler or reverser.

CA Navarro said he would suggest to others that when flying an RNP approach, no speed restrictions should be permitted until they all had more experience. He said it was not a training issue, but an issue of needing more experience. He also suggested the idea of having required currency levels for RNP approaches similar to those used for HGS (Heads Up Guidance) approaches. He said no one was requesting to do them and ATC did not offer the approaches as a matter of routine. He said going in on an RNP approach with a speed restriction was probably not a smart thing to do.

He could not recall if he had seen the flashing auto throttle disconnect light on the approach.

Interview ended at 1730.

Interview: David Newton, Senior Manager of Nextgen and Airspace – Southwest Airlines
Date: June 14, 2011
Location: via telephone
Time: 1110 EDT

Present: Evan Byrne, David Helson - National Transportation Safety Board (NTSB); Greg Bowen– Southwest Airline Pilots Association; Keith Griffith – Southwest Airlines; Tom Phillips – Boeing; Bob Hendrickson – Federal Aviation Administration

Captain Newton was represented by Mr. Dane Jaques.

Captain (CA) Newton stated the following information:

His full name was Christian David Newton and he was 52 years old. He was the Senior Manager of Nextgen and Airspace at Southwest Airlines (SWA). He had been with SWA for 23 years and had been in his current position for a year as senior manager, and before that he was Project Lead for RNP. He was a check airman (CKAM) since around 2005 and before that he was a line pilot. He was still flying the line and estimated that he had logged about 18,000 hours total flight time, including about 14,000 hours in the 737 and about 10,000 hours PIC in the 737.

He said he had a PT (proficiency training) event yesterday where he flew 2 RNP (required navigation performance) approaches. Before that he had last flown an RNP approach about a month ago in actual flight. He said he flew one in January 2011 when SWA first started doing them.

CA Newton said they had 13 airports where they have "efficient" RNP procedures and another 13 or so where they have more straight-in RNP approaches. He tried to fly the efficient or curving RNP approaches where possible.

CA Newton stated that the RNP program began in July 2007. The airline had to go from using very little automation to using very much automation. RNP was part of it but the effort expanded beyond that to equipment, equipage, displays, procedures, and included GPS (global positioning system) and RNP approaches. There was also a lot of work to be done fitting the pieces together for the ops specs (operations specifications) and the other regulatory components.

He described the RNP project as a special "carve-out" project, rather than being handled by a specific department, that involved 3 project pilots who were also part of the team. In addition to this small team, support was provided throughout the life of the project by departments including avionics engineers, dispatch, flight operations, and crew training.

He said his task was to move SWA from where they were to a more sophisticated form of flying – RNP. Southwest's mission statement was safety, passenger service, and efficiency. Relating

that to the project he said that assumed that what they were already doing was safe and provided passenger service; and the missing piece was flight efficiency and that is where they focused.

They took a lot of information initially as basic guidance policy starting from the company philosophy and drove that into a policy where they wanted pilots to use the LNAV and VNAV mode where it was more efficient for safety and passenger service.

CA Newton said upper management was onboard from the beginning and it was a discussion with flight operations at the upper levels with management discussing this for a significant amount of time to determine what they wanted.

The first part of the project was to begin to understand the problem. Before the project their glass-equipped aircraft had basically an analog presentation of instruments. In addition they did not have the use of autothrottles or VNAV (vertical navigation). They did use LNAV. To get to RNP they needed a different display and needed to activate autothrottles. They wanted crews to fly with autothrottles because they were more efficient, and there were also efficiencies to be gained with introducing VNAV. However, they did not want to make all of these changes at one time. Instead they used a building block approach.

He said the first step was a CBT (computer based training) module in November/December 2008. Then they started to use autothrottle and VNAV above 10,000 feet in January 2009. Then the next step was a CBT module on PFD's (primary flight display) and teaching GPS approaches, vertical speed approaches, and RNAV (area navigation) fundamentals such as the 24 satellites in the GPS constellation, and RAIM (receiver autonomous integrity monitoring). Then Step 3 training was September 2009 to about March 2010 which addressed primarily PFD's, GPS, and VNAV approaches. Then finally Step 4 ran from May 2010 to November 2010. That was primarily RNP approaches and engine out SIDs (standard instrument departures).

CA Newton said the guidance sources for this project came from several areas. FAA guidance was in the form of AC's (advisory circulars) 90.101 and 90.105. In addition there was Boeing's guidance in their FCOM (Flight Crew Operating Manual) and FCTM (Flight Crew Training Manual). They also had referenced discussions with others in the industry. Specific procedures were driven by AC 91.101 guidance, and also from FAA's AFS 470 branch. Boeing support included conversations with the B737 tech pilots and the D6 performance documents on what the RNP capabilities of the aircraft were. They also relied a lot on Naverus (who he said was now owned by General Electric) guidance as a basis for writing the initial operations specifications. He said they used SWA philosophy for automation but Boeing guidance for the navigation capability of the aircraft and for the RNP procedures.

CA Newton said there were significant challenges with the mixed models of the 737 they had. They did not want so many differences that it was difficult for the crews. He said you could not fly RNP with their classic aircraft. It was a cultural hurdle as they were not used to automated ways of flying. That was why they approached the problem in building blocks to implement it over time. They wanted to make sure that they did not change so much that it was overwhelming for the crews. The primary focus was on the crew as they did not want them to have to use one set of procedures one day and then get into another aircraft and use a whole different set of

procedures the next. They viewed it as a risk and did not want the introduction of RNP to be a detriment to how they flew the aircraft.

The primary guidance for the aircraft differences was the AC 90.101 guidance. There was some guidance in that document about what needed to be trained for RNP.

CA Newton said they were trying to move away from the dive and drive type of approach and use vertical speed or constant descent angle approaches about the same time. He said he would prefer to fly a GPS with LNAV/VNAV guidance instead of a localizer back course. He knew you could not do the former if you were out flying on a classic.

He said as part of the 8900 process they had meetings with the FAA for ops spec approval. They would have Ops Spec paragraphs C384 and C052 for GPS approaches. They did a block approach where they built their crews up to get to RNP. He thinks that there was some confusion on the FAA side as they had developed a large application process. FAA had issues with some things for example map range, tuning a navaid, path guidance. He said it was a big project so they tried to focus on developing it for the pilots instead of for the regulatory process.

CA Newton said there were several groups involved in the development of procedures including project pilots and GE / Naverus who provided some initial training in RNP. Procedure development was based on existing industry experience, Boeing guidance, and GE / Naverus along with the airplane flight manual (AFM) and building on their existing procedures.

He said SWA had an ASAP (Aviations Safety Action Program) program. There was an ASAP office that collected the data which was fed back through safety programs and procedural changes. Once procedures were implemented you observed behavior and fed information back as necessary.

He said they used FDAP (Flight Data Analysis Program), which was SWA's FOQA (Flight Operations Quality Assurance) to monitor operations but specific to the RNP program, after flying an RNP approach at SWA, pilots must file an ACARS (aircraft communications addressing and reporting system) report consistent with AC 90.101 on its outcome or why it was not flown successfully if it was not. They collected that data and were looking for specific problems with navigation performance or reported crew procedure issues. If ATC (Air Traffic Control) took you off the approach for whatever reason it was reported as unsatisfactory because ATC vectored you off the approach but that was not a navigation performance issue or crew procedure issue. An RNP approach was satisfactory if it concluded with a landing from the RNP procedure.

CA Newton said they had been collecting the reports on RNP approaches since January 2011. They had in excess of 4600 RNP procedures that have been flown and reported. About 6 percent of those were unsatisfactory for various reasons. Of that 6 percent, 65 percent was for ATC reasons, about16 percent were due to limitations (temperature limits for example, or RAIM), about16 percent were other and included remarks but were not identifiable to a bin. About 3 percent of the unsatisfactory RNP approaches were systems reasons, for example; an MEL (minimum equipment list) that the AP (autopilot) was inoperative. The system things were also

things like UNABLE NAV PERF message displayed during approach or something failed. About 1 percent was due to procedural reasons. Procedural items were things like if the VNAV did not work that day or the crew could not get the airplane into VNAV at the proper point. They were interested in that 1 percent of the 6 percent – only a handful fall into that bucket.

Prior to January 2011 they had collected data through FDAP/FOQA and ASAP. They had also collected information through a LOSA (Line Operations Safety Audit) program but that data had not been reduced yet.

When they concluded the step 3 training they required pilots to fly 6 RNAV GPS approaches in VMC conditions; 3 as pilot monitoring (PM) and 3 as pilot flying (PF). Step 3 training process was 6 months. There was no currency requirement for GPS approaches; it was just another approach type. RNP was a little bit different however as it required that every pilot flew one RNP SAAAR (special aircraft and aircrew authorization required) approach to a landing and one to a missed approach in their recurrent training. Hence they required everyone to do 6 when they started GPS. The RNP recurrent training requirement was a regulatory requirement.

They did not get formal feedback from pilots about the 6 approaches – but may have gotten feedback indirectly through FDAP. Pilots had to fill out a form to say they had flown the 6 approaches. That was something they thought was the appropriate thing to do. It was just tracking the number of approaches; they did not collect comments or feedback on that form.

He was asked about guidance on use of automation during an RNAV RNP approach. He said you had to be in LNAV and VNAV PATH. Those were requirements to be established on the final approach segments. Prior to the final approach segment you could be in any mode you want.

He said there was no formal requirement or timeline to get to the unrestricted use of RNP (vs the 500/1 limitations that they had established at this time). They wanted to make sure that all pilots were able to get them in the PC (proficiency checks) and PT (proficiency training) events. His understanding was that there had been no reported issues there. The next step was to petition the FAA to reduce to charted minimums, unrestricted RNP.

The preparation for a SAAAR approach was done from memory after training. However, he said there was an RNP reference card available on the flight deck. It outlined the equipment requirements. The equipage issue was not a big issue. The big difference was you had to enter an RNP value in RNP as compared to a GPS approach where you did not. An RNP approach also may have RF (radius to fix) legs and/or speed limitations. The airplane was capable of flying either. The AP is required to be engaged if you were flying below RNP .3. Right now they could not go below that. Technically you were not required to fly with the AP engaged but he thinks that most pilots were using it. For all RNP approaches the AP has to be available, but only has to be engaged if you go below .3, which would be part of their next step.

CA Newton said SWA uses conventional training rather than AQP (Advanced Qualification Training and each pilot would get 2 RNP approaches in the training center every 6 months as part of recurrent training.

He said he did not recall anything specific that required additional training of flight crews during the implementation of the RNP program. One problem was the snowflake on the ACARS for the post RNP report not appearing. They had to put out a bulletin on how to do that and he thought it was possible that they were underreporting the number RNP approaches, both satisfactory and unsatisfactory, as a result. He said he did not recall needing to make any changes to the procedure during the implementation.

He said when they first started in April of 2010 they were seeing better stable approaches in their FOQA data for the RNP and GPS approaches and a higher incidence of unstable approaches for the other types of approaches. He said the data indicated that when folks were in LNAV/VNAV PATH it was a higher rate of stable approaches than for example a visual approach.

Regarding pilot feedback on the new approaches, he said Anecdotal evidence from pilots was that ATC was not letting them do RNP approaches. He recalled another report that someone was able to pull the power back to idle at 41,000 feet and leave it there until spool up on the approach; which the pilot thought was pretty cool. He said there may be data that showed they were trending fewer and fewer RNP approaches as they went through the program. There was an indication of Month by month changes that could be attributed to better weather or ATC.

CA Newton said he had not been involved in any briefings or investigation into this event. He said he did not know the FO. He said he was not sure if he had ever flown with the crew but thought he had met the captain a long time ago.

He said they had not updated their classic airplanes with PFDs or glass as that program was still undergoing certification. He said they fell under the category of frequent operations of multi variant types in the flight standardization board report. He said there had been a study done recently which indicated that on average a pilot saw a Classic or NG about every 45 days. He said a pilot could swap back and forth between a classic and NG (next generation) aircraft on the same trip. He said he did not think it was a problem and he enjoyed flying both of them, that he did not really even notice the difference as far as an instrument scan while flying.

CA Newton said they concluded Step 3 in March 2010, started changing the -700 displays to PFD/ND from analog on April 6, 2010, and started GPS operations in revenue flight for pilots to start logging their 6 approaches.

He said on January 11, 2011 they turned on RNP approaches on the line. They needed to get a minimum of 100 RNP SAAAR approaches before they were authorized for unrestricted full RNP approach. He said they had gone well past that but had also added an extra step. They went from using minimums of 1,500 foot ceiling and 3 miles visibility to 500 foot ceiling and 1 mile visibility. The next step was to use charted minimums and they needed to petition the FAA for that. He said they reduced from the 1,500 foot to 500 foot minimums on February 24, 2011.

CA Newton said that they had logged about 4,600 approaches since January 2011 and although they had not projected the expected number of approaches, they were happy with the results. He said only about one third (23 airports) of their destinations had the procedures.

He said they saw RNP as being good for SWA as far as increasing efficiency. They tried to design the process so pilots would see the benefits. He said they were concerned with overcoming the hump of adding a new approach but he said once you have done a few of them, they were "no big deal". He said he had not seen any data to suggest that pilots were not asking for them anymore.

He said that they had talked to folks within NASA about automation policy and they had been reasonably pleased and that some of their procedures had been based on CAST (Commercial Aviation Safety Team) studies and previous SWA experience.

CA Newton said they used guidance from the FSB (Flight Standards Board) to establish the amount of training required to convert from analog to digital flight instruments, and they had also done a T3 test. He said there was no direct guidance to go from our EFIS (electronic flight instrumentation system) MAP to PFD/ND. They did a test using pilots and then brought them in some time later to determine how they retained the information. He said it looked like the guidance from the FSB that they were going to be tied to was a bit more significant than they thought it should be. He stated the guidance called for 12 hours of simulator time on just the displays for example. He said they also had a significant amount of ground school time to learn the displays. He said they also knew there would be another look at the training for the RNP training.

He said that in Step 2 there was significant guidance on the PFD display and hands on simulator training first occurred in Step 3. He recalled that the curriculum covered PFD's auto throttles, takeoff and landing, and approaches and was covered during one simulator training event in Step 3 and an 8 hour ground school.

He recalled that in Step 4 there was an 8 hour ground school and 6 hour simulator period which covered engine out SIDs and RNP approaches.

CA Newton said automation policy and levels of automation use came from CAST guidance, that it was a rubric to understand what levels you should be in. The primary concept was to use the automation in the highest level or mode that was available to you that was coincident with safety, service, and efficiency. The path is where LNAV/VNAV and the increased efficiency came in.

Regarding data collected on stabilized approaches he was not sure the reason for the observation that visual approaches were less stable. He said that ILS, GPS, RNP approaches were very procedural as compared to a visual approach and he thought that the procedural steps may lead to more stable approaches.

CA Newton clarified that the classics had analog instrumentations. The NG's had two fairly large glass panels that displayed the flight instruments and map to the pilots. They used to have an EFIS/MAP which included an analog representation on the glass instruments. On April 6, 2010 they started flipping those to PFD/ND format. He said the project was completed very quickly. He said they had 197 classic aircraft (25 500's and the remainder were 300's). The

remaining aircraft were all 700 series – he thought the fleet was 552 total (estimated that 65 percent were NG's).

CA Newton said the greatest challenge has been the culture transition. Going from not so much automation to a fully automated cockpit, using autothrottle and VNAV but he thought the pilots had adapted well. The equipage was the least challenge although it was a lot of work. He said they noted that the better equipped they were, the more training was required but there were also more tools available to the crews. He said they did not want the NG to outpace the classic so much that there were just too many differences.

He said moving forward they were focused on some other issues at the airline. In a sea of change it was sometimes hard to highlight smaller changes to our existing programs.

Interview ended at 1243.

Interview: Kevin Fergerson, Manager of Procedures – Southwest Airlines
Date: June 14, 2011
Location: via telephone
Time: 1405 EDT

Present: Evan Byrne, David Helson - National Transportation Safety Board (NTSB); Greg Bowen– Southwest Airline Pilots Association; Keith Griffith – Southwest Airlines; Tom Phillips – Boeing; Bob Hendrickson – Federal Aviation Administration

Captain Fergerson was represented by Mr. Dane Jaques.

Captain (CA) Fergerson stated the following information:

His full name was Kevin Dale Fergerson. He was 47 years old and had been at Southwest Airlines (SWA) for 19 years including about 8 months in his present position, Manager of Procedures. He was a civilian-trained aviator and attended Oklahoma State University. He had worked at a couple regional airlines where he gained experience as a First Officer (FO), check airman (CKAM), and Manager of Training. He had also worked at Flight Safety as a simulator instructor and designated examiner. At SWA he has worked on a handful of projects over the last 10 years. He had logged about 15,000 total flight hours including about 10,500 hours on the 737 and about 7,000 in the 737 as PIC. He estimated his total PIC time as about 11,000 hours.

CA Fergerson said he reported to Tim Leonard who was the Director of Regulatory Compliance, Operations, and Procedures. CA Fergerson described his duties as being primarily responsible for the Flight Operations Manual (FOM) and Quick Reference Handbook (QRH). He had about 8-10 pilots in varying capacities working for him at any one time on procedural initiatives, QRH revisions due to new equipment to information coming in from ASAP (Aviation Safety Action Program), InFO's (Information for Operators) and SAFO's (Safety Alerts for Operators).

He described flight crew procedures for use of the OPC (OnBoard performance Computer) on approach. Prior to TOD (top of descent) crews should acquire the ATIS (automated terminal information service) and NOTAMs (notices to airmen). They then use the OPC to assess their landing capability. The OPC gave them stopping margins based on different environmental conditions. The use of the OPC is typically done at TOD but some of it hinges on the weather – for example you may have to redo it or review it later in the flight if conditions are changing. The OPC tells you when something is not acceptable. He said any stopping margin that was a positive value was considered acceptable. If it happened to be negative it was highlighted in reverse video red on the color OPCs which all of them are now. He said the highlighting stood out and was pretty obvious.

As far as specific criteria or guidance on when crews should review/recalculate the numbers using the OPC for changing conditions he said he would have to look up in the manual for what the guidance said. He said at the least it would fall under the "safety, service and efficiency" overarching guidance. He believed there was some kind of general statement in the manuals about doing that. The weather information came primarily from ATIS on most days. If you saw obvious rain shower activity you could go ahead and select "wet". If you had reason to believe the weather was less than advertised you would go with that. For example; he said you could use information coming from a pilot report.

He said the OPC gave you an "autobrakes required" banner message on the landing output screen just below the performance values but it did not tell you what setting to use. He said if for example autobrakes 2 did not have a positive number it would be in reverse video highlighted in red and you had the option of using the next two higher settings. The OPC also gave you on the right hand side of the screen information about thrust reversers – detent two normally, and in some situations would state max.

CA Fergerson said the assumptions were mentioned in the performance section of the flight manual and also the OPC section. There's probably some overlap between the two. Ground spoilers are also required to meet the landing criteria. On the landing input page you could select reverser inoperative, autospoiler inoperative. You had to tell the OPC if those things were not working so it added the penalty or did not take the credit depending on how you wanted to look at it for the use of that device. He said the FOM did not reflect the OPC credit number for reverser, spoiler, and autobrake deployment. Crews are instructed to use detent 2 reverse thrust and spoilers being armed on the before landing checklist was the normal procedure. He did not believe the manual mentioned a specific amount of time required for deployment of thrust reversers after landing.

Regarding the mixed fleet at SWA he did not think there was anything specified on recurrent or PT (proficiency training) or PC (proficiency check) that required pilots to alternate aircraft (classic vs -700). He said they did cover all the variants during recurrent ground training and the home study exams that they took twice a year. They also referenced the FSB (Flight Standards Board) report and aircraft engineering group information that was instrumental to see if they had any recurrent training needs as they went through the changes associated with the RNP (required navigation performance program.

CA Fergerson said he was still current and qualified as a line pilot, that management pilots were required to fly at least one trip a month, preferably a 3-day. He said the last time he flew an RNP approach was late April 2011. He said he tried to fly one every time he was out but the opportunity did not always present itself. It averages out to every other time he flies – so he is getting to fly an RNP approach once every other month at a minimum.

The RNAV (Area Navigation) approaches, both RNP and GPS (global positioning system) were restricted to the 737-700. They did not have autothrottles activated on any of the classics and they did not require autothrottle use either.

Regarding restrictions on use of automation on RNP and GPS approaches, he said LNAV/VNAV (lateral navigation / vertical navigation) must be used on the approaches. They also restricted any modifications to the FMC (Flight Management Computer) from the FAF (final approach fix) inbound. He said it was also somewhat restrictive on what you could do outside the FAF. They also restricted them to just the -700 series.

He compared setting up an ILS (instrument landing system) vs. RNP approach. For the ILS he said you were dependent more on course selection and frequency tuning. For the RNP you were verifying your database and programming the FMC which takes the place of course selection and frequency tuning of ground-based navaids.

He compared differences in the stabilized approach criteria between the two approaches. He said at the time of this accident, for an ILS approach they needed to be stabilized before reaching 1,000 feet above touchdown zone elevation, but it was slightly more conservative for the RNP approach. On an RNP approach they needed to be stabilized by the FAF which in most cases was between 1,200 and 1,600 feet. He said that was consistent with their guidance for non precision approaches. CA Fergerson said that since the accident they had made a change so that any approach with vertical guidance, ILS or RNAV, used the 1,000 foot stabilized approach criteria. He said there were a fair number of approaches that pushed the FAF out 7 miles from the runway so it was an issue with ATC (Air Traffic Control) allowing them to fly the approaches being that restrictive that far out. He said stabilized referred to being in the landing configuration. He said the decision to make the change was based on ATC request, input from crews and chief pilots. He did not know if they collected any ASAP data on this issue but said they had a help line when they started up RNP approaches and they collected data on those phone calls regarding what people were asking or having issues with.

CA Fergerson said the callouts did not vary except on the RNP approach they called out the flight guidance modes “LNAV/VNAV PATH” on the FMA (flight mode annunciator) instead of calling out “localizer / glideslope” capture for the ILS. He said the rest of the callouts were the same, for example, the “1000”, “approaching minimums”, “minimums”.

He said there was no difference in guidance provided to crews on conducting these approaches in VMC (visual meteorological conditions) vs. IMC (instrument meteorological conditions).

CA Fergerson said pilots were required to verbalize the modes engaged on the mode control panel (MCP) which would be stated on the FMA. When you were changing modes you were

supposed to state that at any phase of flight not just approaches. He did not recall exactly what Boeing recommended but he thought SWA procedures were similar. He said all the human factors and best practices that they looked at while developing RNP suggested that was the best way to go in order to be able to recognize what flight guidance mode you were in.

He said they had callouts on normal landing for 60 knots, autobrake disarmed by PM (pilot monitoring) and the PM would also in abnormal situations announce if reverse thrust was not activated or failed to deploy. There was also a FO-specific callout for speedbrake if they did not autodeploy. That was based on the location of the speedbrake handle which was on the captain's side and if someone had to manipulate it, it would normally be a captain duty to do so. He believed that they instructed the captains to deploy it if they did not deploy manually. He did not know if that was consistent with Boeing procedures or not.

He is not aware of any company procedural guidance on use of an EMAS.

As for whether to evacuate or not in a situation away from the gate he said pilots could go to the QRH and there' was some guidance there. But he acknowledged that there were so many variables to consider it was hard to put down specific guidance for all situations. The QRH also had some considerations on how to command an evacuation.

He said the captain was supposed to arm the spoilers and anytime you moved a switch you want to make sure you get the desired result. He said the speed brake was the first item on the before landing checklist.

CA Fergerson said before this position he had worked as a project pilot primarily on RNP development. RNP and automation was new to them. He said that during the project they referenced Boeing manuals, and also Boeing flight test and support people to help them. They also looked at other air carriers, Alaska, Continental Airlines, American Airlines, and Naverus. They also used FAA guidance from AC (advisory circular) 90.101 and 90.105. All these sources helped define the procedures and go through the operations specification process. He thought also that AFS 410 or AFS 470 was involved.

CA Fergerson said the catalyst for change may come from several sources. Maybe an AC, SAFO, InFO, ASAP program internal, or data coming from FDAP (flight data analysis program), pilot suggestions, capability of the aircraft either new equipment or a change by Boeing on what they thought, and even input from flight standards group, check airman, chief pilots. He said any source was considered valid. When something came in they dropped it into their database. That task got assigned to somebody or some group. That group would research and work through the problem and if appropriate would come up with a procedural change. They had 8 or 10 people working there and the first step was to run through a critical review process for any proposed solution. People from safety and standards were also involved looking to see if it was a good product and viable product before going to the quality assurance group. Then if it came back OK they had a flight operations review board. If it was a significant philosophical change in how they fly the airplanes it would also be pushed forward to the director's level. For example, LAHSO (land and hold short operations) – they did not do that at

SWA but they had put together a package for review at the directors' level. If it all goes forward it was submitted to the FAA for approval and incorporated into the flight operations manual.

The FORB (Flight Operations Review Board) met every other Wednesday. On the alternate weeks they had a standing critical review meeting. They usually had something to review in those. It was rare that they cancelled either of those meetings.

As an example, CA Fergerson said they were working on a flight operations bulletin regarding the OPC programming for takeoff flaps of flaps 1 or 5 and put it out to the critical review group for input. That meeting included line pilots and training center instructors, and flight safety and flight standards representatives. A group of about 10-12 people looking at the product. The goal being to have a refined product before going to the FORB so that all the tweaking had been done and they were seeing pretty much a final product.

CA Fergerson said his input into the training program was through the critical review meeting, and FORB meeting, both of which had flight training representatives. His group was also in the training center so they had informal input by proximity.

He said he was not part of a debrief or company investigation of this event and was not aware of any changes in procedures or company guidance as a result of this event.

He said knew the name of the captain, was a casual acquaintance but he had not flown with him, or with the first officer and had not been in a training or checking event with either pilot.

CA Fergerson said the helpline number they set up was an 800 number that crews could call in with questions or issues that they had. It was staffed by training center instructors who had taught the RNP program here. He recalled that some of the information collected was about Oakland approach having issues with speed on the FAF on the RNP approach to runway 29. Other than that, he said there were questions about charting or clarification of procedures. He said considering that they had 3,400 operations a day the helpline was pretty quiet and it would go an hour or two at a time without a phone call. He recalled that they had the line up for about 7 days and it was managed by the training center. He said nothing came to mind as far as any issues brought up on the helpline that needed to be addressed.

He said to determine if changes needed to be made they were tracking the post flight reports to see if there were any unsuccessful approaches and if so, why. He said if it was an ATC issue that it was probably not anything they needed to address. He said the Operational control center handled that data and brought any items to his attention if it was warranted. He said that so far it had been "fairly quiet".

He said regarding any changes to procedures, he said they were not planning on anything except that they had a restriction on approach minimums of 500 foot ceiling and 1 mile visibility and at some point they wanted to submit to FAA a request to use charted minima. He said in order to do that, they had to track RNP approaches, the success of them, determine that there are not any issues and then make the request. He said they had probably already collected enough data but

had so many irons in the fire lately that they had not gotten around to it yet. He thought they might try to pursue that in the next 60 days.

CA Fergerson said the biggest challenge to getting to fly an RNP approach was to be in a 700 airplane, you had to have an airplane that was authorized to do it and be in a place where it served the safety, service, and operational efficiency and that it was not just going to delay the flight. He said if he was going into Corpus Christy for example they had nice, efficient approaches but if he was going to Kansas City, the RNP approaches were not a benefit at all and probably worse than doing an ILS. He said he thought they may have already taken Kansas City RNP approaches out of their approach package on the airplanes. He said another issue was how busy ATC was and if asking for an RNP approach was going to compress traffic flow.

He said he was not sure that there was a specific flow or anchor point or flow for the captain to arm the spoilers for landing.

He estimated that based on current procedures in real time it took about 2 minutes to brief an ILS approach and would be about the same amount of time for an RNP approach.

CA Fergerson said that on an RNP approach there was no requirement that autothrottles be used, but the autopilot was required to be used for RNP less than 0.3. He said he did not think they had distinguished between IMC and VMC for this guidance.

Regarding FMA changes, he said if the autopilot was engaged the pilot selecting the change should announce it and if the autopilot was not engaged the PF would normally direct the PM to make selections on the MCP, which constituted verbalizing the selection, but verified the FMA silently.

He said the landing distance on OPC was based on an assumption of touching down 1,500' beyond the runway threshold.

CA Fergerson said the biggest challenge he faced was keeping up with all the information that was coming out from industry, manufacturer, and government and getting that into the hands of the pilots so they had the knowledge and tools to be able to operate safely and efficiently.

He said all of their approach charts were produced by Jeppesen. Generally speaking they looked like Jeppesen charts but the non-ILS charts were the CAO (commercial airline operations) which were somewhat tailored charts with C and D minima, and no LPV minima so they are less cluttered. He said they also had rings for distances from airport. For ILS charts they still choose to tailor them because of the various operations specifications variances. He said the FAF is where the final approach segment begins. Both are depicted similarly to an ILS. Where the vertical guidance on the approach begins to the runway and on a non precision approach you'd have a Maltese cross at the FAF.

Regarding mixed automation, CA Fergerson said there was some discussion about allowing the use of autothrottle with the autopilot off. He said they discussed it with Boeing and referencing guidance in the flight crew training manual to allow Auto throttle use in takeoff and climb but on

cruise, descent, and approach you must disengage the autothrottle when the autopilot was disengaged.

Interview ended at 1533.

Interview: Cathy Dees, Pilot / CRM Manager – Southwest Airlines
Date: June 15, 2011
Location: via telephone
Time: 1110 EDT

Present: Evan Byrne, David Helson - National Transportation Safety Board (NTSB); Greg Bowen– Southwest Airline Pilots Association; Keith Griffith – Southwest Airlines; Tom Phillips – Boeing; TR Proven – Federal Aviation Administration

Captain Dees was represented by Mr. Dane Jaques.

Captain (CA) Dees stated the following information:

She held the positions of Captain and also CRM (Crew Resource Management) Manager at Southwest Airlines (SWA). She was hired by SWA about 17 years ago and had been the CRM Manager for about the last 6 years. Barnes Pruett held the position before her and he left to take a new position in the training center and as a Check Airman (CKAM).

CA Dees said she graduated from University of Oklahoma with an aviation degree, had worked as a flight instructor, a freight pilot, a corporate pilot for a major corporation, and then was hired by SWA as an FO (First Officer). She said she upgraded to captain about 10 years ago and estimated that she had logged about 15,000 hours total time, 10,000 hours in a 737, and about 5,000 hours of the 737 time was PIC (pilot in command) time. She had not been a CKAM at SWA but had held the position of CRM Facilitator for new hire and upgrade programs about 8 years previously. She said she had flown the line about 1-2 trips per month the past few years but was going to start flying 3 weeks a month because she had just added a CRM Instructor Lead to assist her with the CRM training.

Regarding human factors training, she said she had not completed a degree program but regularly attended industry conferences and meetings. She estimated that she either attended or facilitated 1-2 conferences or meetings annually and that most recently, she had attended a Human Factors conference at Love Field. She said that last year she had attended the Cognitive Interviewing and Fatigue Risk Management courses at the NTSB as well as a Just Culture class.

CA Dees said her primary responsibility was for courseware development, implementation of CRM into training programs, training the trainers, and that they integrated ASAP (Aviation Safety Action Program) / FDAP (Flight Data Analysis Program) into all of their training

programs. She said she did not regularly interface with the Flight Operations department or with training department outside of CRM.

She reported to the Training Manager (Barnes Pruett) and to the Chief Pilot (Mark Montgomery) and had 1 full time CRM team lead instructor and 6 line pilots who worked part time as CRM class facilitators. She said most of them had been hired before she took the position as manager but she had just interviewed to hire two more. She said the total would still be 6 as two were leaving. She said the group had worked together since she had been there, was very stable, and that the only reason anyone left was for a promotion; which was the case for the two leaving now. She said they evaluated the trainers by conducting training, observation, and pilot feedback.

CA Dees said she was responsible for 4 courses: New Hire, Upgrade, Upgrade Leadership, and Recurrent. She said the New Hire curriculum consisted of two parts and that on average there were 20-24 students in each class. The classes were a mix of lecture and facilitation with one facilitator for each class. The first part was a 90 minute class which covered basic communications and the second part was a full 8 hour day which included some mixed training with new hire cabin crew members. She said there was also some home study material provided but it was not required training.

She stated that the course was developed before she became the manager but she had made some changes. The course topics included CRM background, effective communications, identifying threats, assessing risks, managing errors, and the use of briefings for effective communications. She said mainly the changes were updating course material to address new information obtained from accidents, incidents, and NTSB investigations as well as other new information.

She said in the past they had worked on development of the course with outside consultants Immanuel Barshi from NASA Ames, and with Bill Taggert, and Bob Helmreich's group at University of Texas.

SWA course also included discussion on data obtained from ASAP, FDAP, NTSB reports, and data from the ASRS (Aviation Safety Reporting System) national database and the courses were updated twice each year.

CA Dees said the Upgrade class was a half day (4 hour) ground school followed about 6 months later by the full day (8 hour) Upgrade Leadership class. She said the size of the upgrade classes varied depending on how many captains were going through upgrade and that the 8 hour class included mixed training with cabin crew, dispatchers, maintenance, and ground operations personnel. She said they were all included in a 1 ½ hour section of the course. She said the content of the course was based on the approved FOTM (Flight Operations Training Manual) and AC (Advisory Circular) guidance. These courses had been developed before she became manager but she had made some changes which she categorized as "not significant" such as updating events and data obtained from ASAP analysis.

CA Dees said the recurrent ground school course was an 8 hour class in which a portion was devoted to CRM training. She said the amount of time varied each year based on the events to

be covered and was “need based”. She stated that this year recurrent class included about 45 minutes to 1 hour devoted to CRM and focused on risk management and TEM (Threat and Error Management) issues. She said they worked with Volant Systems, who were under contract with SWA, on development of the risk and resource management module. She said the risk resource management module had been taught since January of 2011.

CA Dees said that to determine effectiveness of training, they looked at data to see if there were any trends in communications type errors bucket from ASAP/FDAP data. She did not observe simulator training events but received feedback from instructors and check airman on hot topics or trends they were seeing. She described hot topics as things the instructors might see that are not one offs events. She did not conduct line observations for evaluation purposes but said that since she flew the line she sees it all the time and the FO’s are all really good when flying with her.

Regarding feedback from the FAA, she said they approved the FOTM, training, and she thought they were very happy with it. She recalled that the last time the FAA had observed the CRM training was a new hire course about 2 months ago. She said SWA management sat in on the courses as well and had provided positive feedback. The pilots were all given a critique form to fill out at the end of each class and the critiques were usually very positive and sometimes included some constructive feedback regarding the PowerPoint presentations.

CA Dees said that SWA had integrated TEM since she was hired in 1994. She thought the program was initially started in 1992 or 1993 and the developers had worked with Bob Helmreich’s group at University of Texas.

She said she is sometimes asked to give feedback on Flight Operations procedures that are coming through the system. She stated that the verbalize, verify, monitor program had been introduced with the new automation policy in about 2004 or 2005.

She said guidance to crew regarding managing distractions and preventing breakdowns in performance included TEM principles. The guidance is to first identify the threat, then use risk assessment in order to manage it. They utilize NASA’s communications model which stated to say something, challenge, then act. They try to integrate that into their operational philosophy to mitigate risk. She said automation is one of the threats they identify and teach how to manage it in operational decision making.

Regarding feedback on automation issues, she said she thought they might be moving to a 5 step program to move back to integrating automation and how it should be used only to the level one is comfortable, and include the need to use threat and error identification, cross check and challenge, and effective monitoring and challenging. She said she did not think there had been any increase in feedback since implementing the automation and RNP (required navigation performance) programs.

She said teaching specific strategies to improve monitoring performance by the pilot monitoring has always been one of their biggest human performance challenges but they had introduced it this year in the risk and resource management module. She said first you had to identify where

you were and what resources were in place to manage, such as flows, checklists, briefings, and procedures to improve performance and reduce risks.

CA Dees said she was not involved in the fatigue awareness training, that it had been divided out to a task force. She said it had been identified as a threat, and management of it was included in the recurrent training module although she was not responsible for it.

She said stress and distractions from personal issues was one of the threats they talked about in training and crews were taught to use basic CRM techniques to manage outside stressors like fatigue, personal stress or any task loading or other crew factors

CA Dees said there was no opportunity for mixing captain (CA) and first officer (FO) in CRM training at SWA for initial and upgrade training, mainly due to scheduling issues. She said the only mixing was with flight attendant, dispatchers, and maintenance. In the recurrent training program FO and CA are together and so the CRM module of that program is provided to both CA and FO together. They were in a transition period with the FAA on what kind of training program will be approved for part 121 air carriers in the future so they were maintaining what they currently had. She said the Training Manager would know better what they were considering in terms of future initiatives. She said in recurrent, CRM was integrated into entire day of training and the goal of human factors was to integrate CRM throughout everything and not just a given section. In their recurrent training CA/FO were in class together working through various problems that involve the CRM content. She said this was consistent with NASA Ames research that suggested that CRM should be integrated into all training not just a stand-alone class.

Regarding mixed equipage of the fleet, she said it certainly was a briefing item. It was one of their briefing requirements to brief the use of automation and planned use on any approaches which was of course a CRM challenge. She said there was no difference in the brief for the 300/500 verses the 700 but you just had different monitoring skills that would go along with that. She said their standard briefs had simplified the challenges.

She said regarding flight crew errors resulting from proficiency issues and lack of knowledge of automation that a Bob Helmreich study identified some of the problems. She said she thought the problems were pretty consistent and they were the same ones as before they implemented their program at SWA. She thought that was an old study. She said currently, they would back that up with data from ASAP or FDAP that might present itself as a hot topic.

When asked if she provided feedback to the flight operations department on procedures and specifically flight crew callouts, she said they were developed by standards and procedures and she was not involved in that process.

She since the NTSB had closed the investigation on the SWA 1248 event they had been able to use that as a learning opportunity in the training programs and it was included in the PowerPoint presentation. She said they discussed it and the threats and the gotchas in that case and how to be better equipped in the future. She said they also used the Comair event in Lexington, KY in the training program.

CA Dees said she was not yet included in any discussion about changing the callout for the speed brake up on landing.

She said they had not seen any increase in CRM feedback since automation changes regarding increase in concerns from crews. She said it was a hot topic talked about in recurrent training but that she had not received any increase in feedback directly to the CRM department.

CA Dees said TEM and Risk assessment was the topic that received the most attention industry wide due to it being the focus in the AC of the training required.

Regarding the safety culture at SWA, CA Dees said safety was the number one operating priority and that is what everyone at the company would say; that was their culture. She said they did a really good job integrating ASAP and FDAP data to do things better.

CA Dees said she had participated in a debrief of this event as part of the ASAP program. She said she had met the captain before when she was a new captain based in Baltimore, but she did not know the FO.

CA Dees said she was not aware of any changes to company procedures as a result of this event.

Interview ended at 1210.