NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

April 25, 1997

Group Chairman's Factual Report

OPERATIONS/HUMAN PERFORMANCE

DCA97MA017

A. ACCIDENT

Operator:	COMAIR, Inc.
Location:	Monroe, Michigan
Date:	January 9, 1997
Time:	1554 Eastern Standard Time (EST)[1]
Airplane:	EMB-120RT, N265CA Serial Number 1257

B. OPERATIONS GROUP

Captain David J. Ivey
Operations Group Chairman (AS-30)
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[1] All times are Eastern Standard Time based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate, determined by the Flight Data Recorder (FDR) and Air Traffic Control (ATC) transcript.

Mark W. Lowell[2]
Embraer Aircraft Corporation
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C. SUMMARY

On January 9, 1997, COMAIR flight 3272, an Embraer EMB-120RT, N265CA, crashed while being vectored for an approach to runway 3R at Detroit Metro Wayne County (DTW) airport. The flight was operated under 14 Code of Federal Regulations (CFR) Part 135 and carried 26 passengers and 3 crew members. The airplane was destroyed by impact and a post crash fire. There were no survivors. Instrument meteorological conditions prevailed at the time of the accident.

D. DETAILS OF THE INVESTIGATION

The Operations group convened at 0900 on January 10, 1997 in Ann Arbor, MI to begin the field investigation of the accident. The group interviewed the flight crew who flew N265CA before the accident flight, and pilots who had flown with the accident flight crew, reviewed company records, and viewed the wreckage at the accident site.

The Operations group traveled from DTW to the Greater Cincinnati International Airport, Erlanger, KY (CVG), on January 14, 1997 in an Embraer (EMB-120). The Operations group chairman rode the cockpit jumpseat while the remainder of the group rode in the cabin. On arrival to CVG, the Operations group joined with Human Performance investigators from the National Transportation Safety Board (NTSB) Washington, D. C. office and interviewed COMAIR management and training staff at COMAIR Headquarters. Additionally, the group toured an EMB-120 airplane for familiarization. The Operations group concluded activities on January 17, 1997.

On April 3, 1997, the Operations Group reconvened at the COMAIR Headquarters for additional interviews and to observe and participate in EMB-120 simulator activities. The visit concluded on the same day.

1.0 HISTORY OF FLIGHT

The flight crew checked in at 0940 on January 9, 1997, for a scheduled 3 day trip sequence. The first day was scheduled for seven flight segments with a layover in Richmond, VA. The flight crew departed CVG, 29 minutes late at 1110, and flew to Dayton, OH (DAY). The flight time was recorded as 50 minutes. The airplane was on the ground for 12 minutes while passengers

[2] Mr. Lowell joined the Operations Group as a member on April 3, 1997 and participated in the simulator and interview activities on that date.

were deplaned and the airplane was boarded for a return flight to CVG. According to company records, the flight departed DAY at 1212 and recorded 29 minutes of flight time back to CVG.

Upon arrival at CVG, the flight crew had a 2 hour and 10 minute layover. The accident airplane arrived on a flight from Asheville, NC at 1427. According to the first officer on that flight, he met the accident first officer in the airplane and stated to him, "it was a good airplane and kinda bumpy out there." The accident captain was outside the airplane near the foot of the airstairs, and as the first officer departed the airplane, they exchanged greetings and the first officer restated the condition of the airplane to the captain.

Flight 3272 was scheduled to depart CVG for DTW at 1430. The airplane was serviced with 3,050 pounds of fuel. Flight 3272 departed CVG at 1451, 21 minutes late because the airplane arrived late, required servicing, and a flight crew change. After departure from the gate, the flight crew taxied to the designated deicing area to be deiced. The airplane was deiced with TYPE 1 fluid, which consisted of a 50/50 mixture of ethanol glycol and heated water. The time of airplane deicing was recorded as 1457. COMAIR dispatch reported that flight 3272 became airborne at 1510. The scheduled flying time was 1 hour and 16 minutes. The flight was planned to fly at flight level (FL) 190[3]. The flight was routine until its arrival in the Detroit area.

According to the air traffic control (ATC) transcript, at 1543:08, flight 3272 reported to Detroit Approach Control at 11,000 feet and the approach controller issued vectors for the instrument landing system (ILS) approach to runway 3R. At 1544:15, the controller instructed the flightcrew to reduce to 190 knots, "if able." The flight crew acknowledged the transmission. At 1545:46, the controller instructed the flightcrew to descend to 7,000 feet. Several acknowledged heading changes were issued by ATC, and at 1549:54, the flight was instructed to turn right heading 140, reduce speed to 170 knots. Flight 3272 acknowledged. At 1550:30, the flight was instructed to contact Detroit approach control on frequency 125.15.

At 1550:48, after the crew made contact with approach control on the frequency 125.15, flight 3272 was instructed to maintain 170 knots and descend and maintain 6,000 feet. The flight crew acknowledged. At 1552:14, the flight was instructed to descend and maintain 4,000 feet. The flight crew acknowledged.

At 1553:28 , the flight was instructed to turn right heading 180, reduce speed to 150 knots. The flight crew acknowledged. Again, at 1553:42, ATC issued instructions to maintain speed 150 knots, and the flight crew acknowledged.

At 1553:58, the controller instructed the flight crew to turn left heading 090 and issued a vector across the localizer. The flight crew acknowledged the transmission. This was the last acknowledgment by the flight crew of flight 3272.

The airplane crashed at about 1554.

[3] Altitudes above 18,000 feet mean sea level are expressed as flight levels.

2.0 WEIGHT AND BALANCE

The following information was obtained from the COMAIR EMB-120 load manifest for flight 3272[4]:

Basic Operating weight:	16,864 pounds
Passenger weight(s):	4,250 pounds (25 passengers)
Baggage :	799 pounds (34 bags)
Freight:	10 pounds
Fuel:	3,050 pounds (ramp)
	2,874 pounds (at takeoff)
Take off gross weight:	24,797 pounds
Maximum take off gross weight:	25,353 pounds (AFM limitation)
Takeoff Center of Gravity (CG):	31.0 per cent mean aerodynamic chord (%MAC)
Takeoff CG limits:	20.0 - 42.0 %MAC
Stabilizer trim setting:	2.5 units airplane nose up (ANU)
Stabilizer trim takeoff range:	0.9 - 6.0 units ANU (green band)
Takeoff flap setting:	15 degrees

Based upon flight planned data, the fuel consumed during the flight was about 850 pounds. This figure was obtained using assumptions of fuel consumption during maximum cruise power settings at FL 190 and a flight time of about 44 minutes. Using this figure, the estimated weight at the time of the accident was about 23,947 pounds. The maximum landing weight for the airplane is 24,802 pounds.

For landing, the following speed was calculated based upon the estimated landing gross weight of 24,000 pounds[5]:

Vref 25 flaps	121 knots

According to the COMAIR EMB-120 Flight Standards Manual, if icing is suspected of adhering to any aircraft surface, use flaps 25 Vref plus 5 knots. According to the Program Manager for the EMB-120, there were no minimum speeds provided for flap settings, icing conditions or bank angles.

A manual weight and balance calculation was performed by the Operations group. The takeoff CG was calculated to be 32.65% MAC. All other figures were found to be the same as the load manifest calculations. The CG difference between the group calculation and the company calculation was due to the assumption that bags were placed in both compartments 1 and 2 rather than the company calculation of all bags in compartment 1. The operations group figured the CG for a "worst case scenario."

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[4] See Attachments 2-10.

[5] See Attachment 1.

3.0 FLIGHT CREW INFORMATION

All crew members were certificated under COMAIR and Federal Aviation Administration (FAA) certification requirements.

A review of FAA records indicated that neither crew member had any record of airplane accident, incident, enforcement actions.

3.1 Captain Dann Carlsen

Date of birth: [redacted]-54.
Date of hire with COMAIR: 02-05-90.

Airline Transport Pilot Certificate [redacted]
Airplane Multiengine Land/Airline Transport Pilot
Airplane Single Engine Land/Commercial Pilot
Rotorcraft Helicopter
Instrument Helicopter
Airplane Single Engine Land/Private Pilot Privileges

Type Ratings: CL-65/Airline Transport Pilot
EMB-120/Airline Transport Pilot
SA-227/Airline Transport Pilot
BV-234/Commercial Privileges

Limitations: SA227 Second-in-Command Required

Medical: First Class (issued 08-08-96), with no limitations.

Flight Times:

Total flying time:	5,329 hours
Total flying time COMAIR:	3,252 hours
Total Pilot-in-Command (PIC) time:	3,400 hours
Total COMAIR PIC time:	2,047 hours
Total PIC time (EMB-120):	1,097 hours
Total Second-in-Command (SIC) time (EMB-120):	1,205 hours

Total flying time last 24 hours:	1.9 hours
Total flying time last 7 days:	.26.2 hours
Total flying time last 30 days:	85.0 hours
Total flying time last 60 days:	160.7 hours
Total flying time last 90 days:	234.4 hours

Initial type rating (EMB-120):	12-12-95
Completed initial operating experience:	01-18-96
Last recurrent training:	09-04-96 (AQP Single Visit exemption)

Airplane specific (EMB-120) and general subjects (including CRM and unusual attitude training)

Last proficiency check:	09-12-96 (EMB-120)
Last line check:	03-31-96 (EMB-120)

The Toxicology Report for the Captain is Attachment 11.

3.2 First Officer Kenneth Reece

Date of birth:	[redacted]-68
Date of hire with COMAIR:	10-17-94

Flight Times:	
Total flying time:	2,582 hours
Total flying time COMAIR:	1,494 hours
Total PIC time:	1,008 hours
Total COMAIR SIC time:	1,494 hours
Total SIC time (EMB-120):	1,494 hours

Total flying time last 24 hours:	1.9 hours
Total flying time last 7 days:	21.0 hours
Total flying time last 30 days:	83.6 hours
Total flying time last 60 days:	166.9 hours
Total flying time last 90 days:	250.9 hours

Commercial Certificate Number [redacted] (issued 10-26-92).
Airplane Multiengine Land
Airplane Single Engine Land
Instrument Airplane

Certified Flight Instructor Certificate Number [redacted]
Rating/Level: Airplane single engine land
Airplane multi-engine land
Instrument instructor

Limitations: Valid only when accompanied by pilot certificate number [redacted]

Medical: First Class (issued 06-21-96), with Limitation:
Holder Shall wear corrective lenses.

Initial SIC check ride:	10-20-94
Completed Initial Operating Experience:	11-04-94
Last recurrent training:	09-04-96 (AQP Single Visit exemption)
Airplane specific (EMB-120) and general subjects (including CRM and unusual attitude training)	
Last proficiency check (SIC):	09-11-96 (AQP Single Visit exemption)

The Toxicology Report for the First Officer is Attachment 12.

4.0 AERODROME INFORMATION

Detroit Metro Wayne County, Michigan (DTW) Airport is served by a complex of three parallel runways and two parallel crossing runways. The three parallel runways are numbered runway 3L-21R, runway 3C-21C, and runway 3R-21L. The crossing runways are numbered runway 9R-27L and runway 9L-27R. Runway 9L-27R is ashphalt/concrete-grooved. All other runways are concrete grooved. All runways have high intensity runway lighting (HIRL). Both runway 3L and runway 3R have ALSF-II[6], touchdown zone (TDZ) and centerline lights (CL). Runway 3C has runway end identifier lights (REIL), CL, and a visual approach slope indicator (VASI) V4L.

Runway 3L is 12,001 feet in length and 200 feet in width. Runway 3C is 8,500 feet in length and 200 feet in width. Runway 3R is 10,000 feet in length and 150 feet in width. Runway 9L-27R is 8,700 feet in length by 200 feet in width. Runway 9R-27L is 8,500 feet in length and 200 feet in width. The airport elevation is 640 feet mean sea level and the runway elevation of the threshold of 3R is 633 feet.

The active runway for Comair Flight 3272 the day of the accident was runway 3R. Runway 3R is served by an instrument landing system (ILS). An outer marker associated with the ILS to runway 3R is identified as HURON and is located 6 nautical miles from the runway threshold.

5.0 COMPANY HISTORY

COMAIR[7] was founded in April 1977 with scheduled flights using three Piper Navajo aircraft between Cincinnati, Cleveland, Detroit and Akron-Canton Airport in Ohio and Michigan. Later, Piper Chieftan aircraft were added and in 1981, COMAIR began flying the EMB-110, the Embraer Bandeirante. In that year, the company also went public and traded shares over the counter. In addition, the company began a marketing relationship with Delta Airlines by joining its computer reservations system. Three years later, in 1984, it officially became a Delta Connection Carrier and in 1986, Delta purchased about 20% of the company's common stock.

In 1993 they added the Short Brothers Shorts 330 aircraft to its fleet and in the same year, the Fairchild Metro III. In 1984 COMAIR operated the Saab SF-340 and, in 1988, the EMB-

[6] High intensity approach lighting system with sequenced flashing lights, category II configuration.
[7] Much of the material was taken verbatim from a history prepared by COMAIR.

120, the Embraer Brasilia. In 1993, the company began operating the Canadair Regional Jet (RJ). At the time of the accident, COMAIR was operating 7 Saab SF-340 airplanes, 45 Regional Jets, and 40 EMB-120 Brasilias. The Brasilias were about equally divided between COMAIR's Cincinnati, OH and Orlando, FL hubs while all 45 Challengers and all 7 Saab 340 airplanes operated exclusively from Cincinnati.

COMAIR flight operations are overseen by a Senior Vice President of Operations, who oversees the Vice President of Flight Operations/Corporate Safety, who oversees a Director of Systems Control and a Director of Flight Operations, among others. The Director of Flight Operations oversees two aircraft program managers, one from the Challenger and one for the Brasilias and Saab 340s, the system chief pilot and the four domicile chief pilots, two each at Cincinnati and Orlando.

6.0 FAA SURVEILLANCE

The Flight Standards District Office (FSDO) that provided oversight of the COMAIR certificate was located in Louisville, KY. The principal operations inspector (POI) of COMAIR had held the position for seven years. The staffing for the operational oversight of the carrier included himself and an assistant POI (APOI). Two new positions were created to include aircrew program managers (APMs) for both the Canadair Regional Jet and the EMB-120. The APOI was selected for the APM position on the EMB-120, and at the time of the accident, the APOI position had not been filled.

A review of the FAA's Program Tracking and Reporting Subsystem (PTRS) showed six surveillance activities for the accident captain. One activity was an enroute line check (Code 1624) administered while performing crew member duties on the SA-227 airplane. The other five activities observed were in the capacity of a check airman (Code 1631). None of the six activities were observed while the captain was assigned to the EMB-120. All surveillance activities were reported complete and satisfactory. FAA records indicated that COMAIR had in their inventory and operated 40 EMB-120 airplanes.

Other PTRS activities for fiscal years (FY) 1995-1997 were listed as follows:

FY95	
EMB-120 enroute cockpit inspections (1624)	50
EMB-120 enroute cabin inspections (1625)	24
EMB-120 training program inspections (1626)	1
EMB-120 trip records inspections (1628)	2
EMB-120 check airman inspections (1631)	14
TOTAL ACTIVITIES	91
FY96	
EMB-120 enroute cockpit inspections (1624)	80
EMB-120 enroute cabin inspections (1625)	27
EMB-120 training program inspections (1626)	4

EMB-120 crew/dispatcher records inspections (1627)	2
EMB-120 trip records inspections (1628)	2
EMB-120 check airman inspections (1631)	36
TOTAL ACTIVITIES	151

FY97 (totals to 1/31/97)	
EMB-120 enroute cockpit inspections (1624)	15
EMB-120 enroute cabin inspections (1625)	5
EMB-120 training program inspections (1626)	2
EMB-120 crew/dispatcher records inspections (1627)	2
EMB-120 trip records inspections (1628)	2
EMB-120 check airman inspections (1631)	15
TOTAL ACTIVITIES	41

PTRS activity reports for Atlantic Southeast Airlines (ASA) and Skywest Airlines, both Delta Airline Connector operators, were reviewed.[8] ASA operated 63 airplanes and Skywest Airlines had 50 airplanes in their inventory.

During the week of October 16-27, 1995, a National Aviation Safety Inspection Program (NASIP) was conducted on COMAIR, Inc. Areas of inspections in operations included, operations training, crew qualifications, flight control and flight operations. The purpose of the inspection was to determine COMAIR's overall compliance posture with respect to the Federal Aviation Regulations (FARs), FAA guidance material, and COMAIR's policies and procedures.

Records at the company's main base of operations at Cincinnati/Northern Kentucky International Airport were inspected, pilot ground and flight training was monitored; various company employees were interviewed; and ramp, spot and enroute inspections were accomplished.

A total of eight findings were reported in operations. Seven category "C" and one category "B" findings. There were no category "A" findings. There were no findings documented during the inspection that were investigated for possible non-compliance with FARs. According to the POI for COMAIR, all were corrected.

Personnel from the Department of Defense (DoD) Air Carrier Survey and Analysis Office conducted a biennial survey of COMAIR, Inc. at the company's headquarters in Cincinnati, OH on March 18-21, 1996. The company was found to meet all DoD Commercial Air Carrier Quality and Safety Requirements. All areas of management, flight crew hiring training, captain upgrade, scheduling, safety program, security, and in-flight performance in operations were found to be average.

7.0 OBSERVATION OF UNUSUAL ATTITUDE RECOVERY IN THE EMB-120 SIMULATOR

On April 3, 1997, the Operations Group participated in an unusual attitude ground school briefing prior to entering the simulator. Cockpit familiarization, system demonstration and airplane

[8] See Attachments 13-14.

characteristics were seen and discussed. The simulator, housed in the facilities of Flight Safety International, is used by COMAIR instructors in training and checking COMAIR pilots.

The following scenarios were flown:

- Autopilot limitation/modes
- control wheel displacement
- stall series to stick pusher and stick shaker
- unusual attitudes
- Slow/fast indicator demonstration
- Yaw demonstration with rapid power lever advancement

The instructor stated that the EMB-120 is subject to yaw, more than any other twin engine airplane he has flown. According to the instructor, the non-flying pilot is usually the one that trims the airplane for yaw.

The first indication of stall in the simulator is the stick shaker and the correct response by the pilots is to call: "set max power, flaps 15" if configured in the takeoff or landing configuration. In the clean configuration the pilot calls "set max power, flaps up."[9]

The unusual attitude training was developed after the Roselawn accident[10]. COMAIR management asked the EMB-120 training department to develop a program for unusual attitudes. Pilots are instructed to roll the simulator to get the attitude indicator in an unusual presentation. The maneuver is started at 10,000 feet, 170 knots, 35% torque, 85% NP. The nose is pitched up 15 degrees above the horizon and aileron is applied full deflection. In order to fully deflect the ailerons, the non-flying pilot must have his knees together or in towards the control column. Most pilots will want to relax the bank angle input. COMAIR emphasizes that when upside down, they must push forward, not pull back on the control yoke. Most pilots will lose about 1,000 feet of altitude during the first demonstration. They will then use the "simulator freeze" during the next phase of training. The demonstration is repeated and a discussion of the attitude indications are pointed out during various stages of a 360 degree roll. COMAIR emphasizes how the EADI will always contain information relating to the sky or the ground on the instrument. They let the pilot perform a 360 degree roll in the simulator and point out the chevron indications on the EADI both above and below the horizon on the instrument.

After the demonstration and explanations, the pilot is allowed to encounter an unexpected roll upset. The simulator has a jet upset scenario that simulates a wake vortex, and about 10 seconds after inputting the malfunction the airplane will enter the vortex. It depends on the pilot input on the controls as to where the vortex is encountered. Depending upon the entry point dictates what will happen. Later in the session they will get an unexpected wake upset.

Knee and leg interference with control wheel deflection was observed in the simulator.

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[9] See Attachments 27-28.

[10] See Attachments 31-43.

Next, a normal takeoff was made with a climb to 6,000 feet. A demonstration of yaw and "P-factor"[11] was demonstrated by varying the engine power.

Autopilot modes were demonstrated to include the heading mode, ½ bank mode, soft ride mode, and turn knob modes. Climb and descent modes and altitude select were observed.

First unusual attitude scenario:
Pitch the nose up to 15 degrees above the horizon, then full aileron in the direction of desired roll. The autopilot was off and the air speed was at 170 knots. Emphasis was on pushing the control wheel nose down rather than pulling back when the EADI indication was up-side-down. Three "practice" sessions were accomplished, both to the right and the left.

The instructor used simulator "freeze" to explain what presentations were on the EADI in terms of pitch and bank angle. It was noted that beyond 45 degrees of bank and 30 degrees of pitch (above or below the horizon), the autopilot disengaged. Passing 60 degrees of bank it was demonstrated that certain information displays on the EADI were removed. The blue and brown colors (above and below the horizon) remain; pitch and bank angle indications remain, however, regardless of bank angles and pitch attitudes, there was always an horizon of blue and brown displayed. The Fast-Slow indicator was removed[12]. It was noted that the bank pointer indication moves in the opposite direction of the roll. It was a white-lined triangle, not filled in with color.

After the 360 degree roll demonstration a wake vortex encounter was given.

Upon completion of the upset, a stall series was accomplished in the clean configuration in both level flight and in a bank. An additional stall was accomplished with the landing gear and flaps extended to 45 degrees. The stall series was accomplished to both stick shaker and in one case stick pusher for demonstration. During the stall recovery, right rudder was required during power application. During one flap 15 degree stall series, the autopilot was used. It disengaged upon stick shaker activation. In normal operation, the stall series was done with the motion on and the prestall buffet could be felt, however during all simulator demonstrations the motion was off. The motion was not used due to the number of people in the simulator cab.

Two scenarios were then flown to induce unusual attitudes. Both were moderate intensity. The third scenario was severe intensity.

A fourth scenario was a climbing right turn, to place the airplane in a severe vortex. On the fourth demonstration, the simulator control loading system that drives the control column disengaged.

The simulator then taken to 10,000 feet. A severe scenario was introduced and three complete roll revolutions occurred before recovery.

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[11] The yawing effect of the propeller rotation.
[12] See Attachments 44-45.

The same scenario was flown by the other pilot in the simulator and the he recovered after 3 complete revolutions of roll.

With the autopilot engaged, the control wheel or yoke moved very slightly at bank angles of 25 degrees.

An ILS to 18R at CVG was performed. The simulator was slowed to 150 knots and flaps 15 degrees was selected[13]. An encounter with a jet upset was unannounced during the approach. A recovery was made, and the approach continued to minimums, then a missed approach was executed. The simulator was placed on the ground and the session ended.

[13] See Attachments 29-30.

8.0 INTERVIEW SUMMARIES

James Watson, COMAIR Captain, EMB-120

Mr. Bill McHugh, ALPA attorney was present

Captain Watson stated that he had been employed by COMAIR for 8 years. He had been a captain for 6 ½ years and had accrued about 14,000 hours of total flying time, which included about 4,800 hours in the EMB-120.

He had flown the accident airplane the previous 4 legs. The airplane was flown from CVG to Huntsville, AL (HSV), and the flight crew remained overnight with the airplane. The next morning, he flew back to CVG, to Asheville, NC (AVL) and returned to CVG. The total flying time on the airplane was about 6 hours.

Most of the approaches were flown down to minimums and in IFR conditions. Wing deicing was used on 1 or 2 of the flight segments while enroute. The systems worked "fine." Windshield heat and prop deice was also used.

The icing was mainly "light." Prior to icing the ignitors were turned on. The ignitors were to be turned on for moderate to severe icing. Most everyone turns them on if there is any chance of going into icing conditions.

The approach into AVL was down to minimums; 200 feet. Everything worked fine. The two approaches he flew were using the auto-pilot. He used the auto-pilot on most approaches but turned it off occasionally, once he was established on the approach in order to hand fly it.

He stated that he would like to have kept the airplane. It was flying so good. The auto-pilot was used in all modes (heading [HDG], NAV and approach [APP]).

The crew that brought the airplane in had already gone. He reported that the logbook was clean. It had one write up about a dent or something. He looked back several pages and there was nothing remarkable. There were no open write ups, only the one deferred item that he previously mentioned. There were no comments made to him by the flight attendant regarding cabin discrepancies.

The number 1 engine was about 2 seconds slower than normal until lightoff. It took 4-5 seconds. It was like this on all 4 starts. However, it was still within the time limit of 10 seconds for lightoff.

The airplane flew just like all the rest of COMAIR's airplanes. The EMB-120 is easy to fly. It is extremely stable. You have to trim a lot in the airplane. Every time you change power, you trim. The rudder is highly effective.

After the simulator checkrides, the instructor gave unusual attitude training. They brought him in on approach behind a "heavy" and didn't tell you. The simulator caught you by surprise and you had to recover. The training in the simulator may include windshear, or severe turbulence and the student can choose what he would like to do or repeat. He always seemed to get a windshear. He stated that he had this training about 4 times in the last 4 years.

In unusual attitude training, when the simulator rolls over, add power, step on the rudder and roll wings level. The simulator responds well.

He knew of the accident captain. The first officers liked to fly with him. Word of mouth was that he had a real good reputation. He was a computer expert. He stated that he had never spoken to the captain other than to just say, "hello." He did not know the first officer.

He [Capt. Watson] never had any trouble with icing in the EMB-120. He had flown only one time in severe icing and he changed altitude and that took care of it. If something is wrong with an airplane, the company fixes it. If something is wrong with the deicing equipment, you don't fly in icing. The company does not pressure you to fly an airplane.

He has flown into DTW several times. It is a least favorite airport due to traffic. There had been no pilot reported problems flying into DTW and the company had not reported any problems with DTW.

Captain Watson stated while on approach during icing, one should keep the speed up until 1 dot below the glide slope, then go to flaps 15. Upon glide slope intercept, gear down, flaps 25. Flaps 25 are used for icing. Add 5-10 knots of speed if needed.

The company puts out information on winter flying.

Generally you fly at least 5 miles behind a "heavy." Fly a little high on glide slope for turbulence avoidance. He was not real sure what spacing is required behind a less than heavy airplane. He has never been within 3 miles of anyone.

Sometimes if you are clean, it takes a while for the airplane to slow down. You have good speed control with the flaps out.

Occasionally, an auto-pilot may kick off, but a chime sounds and the airplane just flies itself. He had not experienced any hardovers or sudden movements.

CVG does effective deicing, although it may delay you 30 minutes. Generally, 2 deicers are used, one on each side of the airplane. You are in communication with the deicers and the pilot determines whether or not he needs to be deiced. If any outside source says there is ice on the airplane, you get deiced.

Within 5 minutes of takeoff, the pilots look at the leading edges of the wing to determine if the wing is clean. If the pilot can't determine if the wing is clear or get a clear view of the wing, then the first officer or ground personnel will inspect the wing.

On the last trip into CVG, he experienced ice and turbulence. The auto-pilot worked routinely. No trim anomalies. The #1 engine start was normal; nothing abnormal.

The auto-pilot will not capture if the airplane is above the glide slope. You have to hand fly it down and then recapture with the auto-pilot. If you are flying at 180 knots, the auto-pilot may have trouble intercepting. Pilots may turn off the autopilot, capture the localizer, then reselect the autopilot.

He did not see the accident crew take the airplane. His first officer did see the crew.

David Bryan Yetley
COMAIR First Officer EMB 120

Bill McHugh, ALPA attorney, was present.

First Officer Yetley was hired by COMAIR as an EMB-120 first officer on 4/16/96. He has about 2,800 hours with about 600-700 hours in the EMB-120. He knew the captain and had flown with him at least three times. The last time he flew with the captain was on 1/6/97.

He stated he was the last first officer to fly with Captain Dann Carlsen prior to the accident.

He had flown with the captain a month prior to the accident and again a few months earlier. First Officer Yetley described the captain as very positive, optimistic, fun to work with and never had a bad day. The captain would sometimes make the first officer's job easier by doing some of the outside duties. He did not socialize with the captain outside of their jobs. He believed the captain owned his own company, a farm and a dog. First Officer Yetley stated the captain said he flew for the fun of it.

He recently learned that the captain was married but was uncertain if he had any children. He wasn't sure what type of company the captain owned but he thought it was involved with software simulation for NASA. He said the captain talked little about his company but checked in regularly with his personnel. He gave no indications of any company problems. The captain didn't seem pressured by his company and was very laid back. He believed the captain owned a farm. The captain did not confide to First Officer Yetley about business outside of flying.

He said the captain was really excited about transitioning to the Canadair Regional Jet. He liked the EMB-120, but liked the jet better and was a former instructor on that aircraft. The captain did not display any unusual characteristics on their last trip together. He was the same as he was on all the previous flights according to First Officer Yetley. He displayed good flying skills, followed the Flight Standards Manual and was very professional. First Officer Yetley ranked the captain as near the top in flying skills and was basically the same person on the ground as he was when he was flying. He described the captain's attributes to be a positive attitude, flew by the book, knowledgeable about systems. and considerate of the first officer's input on operational matters.

He couldn't think of any shortcomings the captain may have had. First Officer Yetley said the captain had a Hewlett-Packard portable computer on which he had flight planning information for all their destinations. The program included information regarding taxi fuel, burnoff and reserve fuel. He did not use the computer for any other flight planning items and always used the flight release as his source for flight planning. The computer was only used as a comparison to the release and they always departed with more fuel that what was on the release anyway.

On the last day they flew together, they flew 4 or 5 legs with some IFR conditions but First Officer Yetley could not recall any icing problems. They flew no legs into DTW and had flown no legs into DTW on any of the previous flights. On the last day they flew together, the captain flew all the inbound legs to CVG. Most of the time the captain would fly at 220-230 knots while being vectored unless ATC requested 210 or 180 knots according to First Officer Yetley. He also said the captain would generally call for 15 degrees of flaps on a 45 degree intercept angle to the localizer or at one dot below the glideslope for an ILS approach because he could maintain the same airspeed on the glideslope. Sometimes the captain would tell him when to begin reducing airspeed for an approach if the captain was the non-flying pilot. The captain hand-flew visual approaches and coupled instrument approaches. The captain didn't mention having experienced any problems with the rudder trim in the EMB-120. He didn't tell "war stories" and had no complaints about the company. First Officer Yetley's roommate had previously flown with the captain and described him as being an excellent pilot, a precise hand-flyer, and fun to fly with.

First Officer Yetley said that on the last day that he flew with the captain, they got only a trace of light icing and that he was really certain about that. He described the captain's use of ice protection as very cooperative and obliging. He would turn on the windshield heat, prop heat and ignitors when the OAT was +5C or less in visible moisture. The captain didn't really come across as an instructor unless he was asked a question and he would not let a first officer make a mistake for learning purposes. He wouldn't let it go that far, because he was pretty much by the book.

First Officer Yetley made no mention of money or upcoming personal events in the captain's life; only that he had a good Christmas. The captain had been in the training department but didn't get to fly enough so he bid a captain's slot to go back to the line. He didn't know how long the captain had been out of the training department. He said the captain liked the EMB-120 and the airline. He said the captain usually selected flaps to 15 degrees based on his position from the airport on visual approaches. He might keep the airplane clean until established on approach. Captain Carlsen never mentioned unusual attitude training to him. He did know that the captain had flown helicopters.

First Officer Yetley had received some unusual attitude training related to wake turbulence but he could not recall what bank angles were encountered. He did not remember ever having rolled the simulator. He said that one of the reasons the captain returned to line flying was that he was away so much.

He said the captain did mention the FAST/SLOW indicator in relation to how fast the auto-pilot would react but he didn't use it as his primary criteria for selecting 15 degrees of flaps. The captain would leave it up to the first officer as to how to fly an approach when the captain was the non-flying pilot. The captain was very consistent as to when he and where he selected 15 degrees. When asked if he himself would have selected 15 degrees flaps at a reduced airspeed of 150-160 knots, he replied that he would and

wouldn't be surprised if the captain would have asked for them in that position. He said that if the captain needed to use ignitors, they would be turned on and generally used them according to procedures. First Officer Yetley said that the captain would not dictate how to fly the aircraft.

First Officer Yetley was asked what fuel criteria was included on the flight release and he said that it included taxi fuel, burnoff fuel and reserve fuel.

First Officer Yetley was asked that if he was instructed to slow to 150 knots by ATC, was there an operational requirement to have the flaps set at 15 degrees. He said that there was not, but he usually put the flaps at 15 degrees around 160 knots because the vectoring speed was 160 knots for a no-flap landing. He said that the captain never mentioned the FAST/SLOW indicator in reference to the selection of flaps.

First Officer Yetley said that he did not know the first officer but after the accident several people said that he was a good first officer.

Ralph McWhorter
COMAIR First Officer

Bill Mc Hugh, ALPA Attorney, was present.

He said that he had been with COMAIR 6 years and had flown 6 years in the EMB-120. His total time was about 6,500 hours with about 5,000 hours in the EMB-120. He was hired at the COMAIR Aviation Academy as a light airplane instructor.

He flew with Captain Watson on the accident airplane for 4 legs. He did not meet the crew that brought the airplane in prior to them going to Huntsville, AL (HSV). He did not look at the maintenance record, Captain Watson did. Standard operating procedures are discussed with regard to deferred maintenance items. He stated they departed January 8 at 2034 in the accident airplane from CVG to HSV. On this flight they were in and out of IFR conditions and the approach was in IMC with thunderstorms in the HSV area. Captain Watson flew this leg and he operated the radar. They used the windshield heat and prop anti-ice at altitude. He was unsure if the wing deice boots were used on that leg.

The instrument approach into HSV was normal with light chop, and the airplane operated as usual.

On January 9, the crew left HSV for CVG at 0830 and arrived at CVG at 0949. He said 1 hour of IMC was logged and no deicing was done at HSV.

Enroute, the crew encountered light to occasional moderate chop and light ice. They landed on runway 18R at CVG with only moderate chop. He used the deice boots and said, "I know they were working." There was no noticeable flying differences in the airplane when the boots were used. The approach was down to minimums. The auto-pilot has to be off by 200 feet above the ground. There were no altitude excursions out of the ordinary during the flight.

They left at 1120 for AVL and the flight was in and out of IFR and icing. The turbulence was noteworthy. It was the same as the earlier flight, another bumpy ride. He didn't recall if he used the boots at altitude or at AVL. The props and windshield anti-ice systems were on..

The approach was down to minimums and was coupled. He believed that the captain took off the auto-pilot somewhere during the approach but could not remember the exact point. He recalled the bumpiness in the AVL area was due to the mountains.

The #1 engine started 2-3 seconds slower than #2, but still within the 10 second limit. At times you have to use the igniter to clear the engine of moisture, but this start was cool and everything operated normally.

They departed AVL at 1305 and had about 1 hour of IFR conditions. Above FL200 it was clear and smooth. It was IMC during the takeoff and landing and it was his leg.

There were no problems during the 4 legs. There were no flags, no nav/com problems, no ADI problems. He rated the airplane as a queen of the fleet and he would be glad to accept it. On approach, he remained coupled until somewhere inside the marker, then he hand flew it to landing.

He did not have any anomalies in the 150-180 knot range and clean. There were no trim problems, they were within limits. Flaps can be selected at less than 200 knots. He never had any roll tendencies when selecting flaps. Just ballooning. He did not recall when he selected flaps for the approach into CVG.

There was no limitation on selecting flaps 15 when in icing conditions or maneuvering. It was a nice smooth landing in windy conditions at CVG. There were no unordinary inputs when the auto-pilot was turned off. The rudder worked and they arrived at the gate at 1427. There were no write-ups put in the book.

He left the cockpit for the post flight. He returned to the cabin and briefly met the accident first officer. He said, "it was a good plane, kinda bumpy out there." He went down the steps and saw the accident captain. The captain was always doing extra things above and beyond his captain duties. He stated to the captain the good airplane status.

He did not the know the first officer, only in passing. He had his hat and winter coat on and looked normal. No negatives, no bad attitude; he did not know him personally.

He did not know the accident captain. He had talked to him a couple of times. He knew he was part of the Canadair Jet Program and now he was in the EMB-120. He stated that he had heard that the captain had an incident with a flight attendant and had to write her up. He regarded that to hangar talk. He had written notes to other stations that were complimentary letters. They had posted some of the letters on the wall for employees to read at some of the out stations.

The captain looked healthy, smiled, and not depressed. Nothing physically wrong with him. He seemed eager.

When ATC handles separation, he would like to see a separation of at least 3 miles. Turbulence enroute is handled well by the airplane. He experienced wake turbulence on arrival and departure and the airplane handled it well. At times he had to use near full pressure on the controls. He had seen as much as 30 degrees of roll in turbulence during a landing phase at CVG, wake turbulence with the auto-pilot coupled. It didn't kick off. It rolled along the longitudinal axis. It was like a little tornado. It handled it well. It was a clear day with good separation and it put the airplane in a left roll. The nose didn't have much pitch change. He believed he used rudder to keep the ball centered.

He had received unusual attitude training and windshear on the last 3 simulator check rides. Once, he experienced a roll over on its back. He used a combination of rudder and aileron to

right the simulator. He used power later. He lost less than 1,000 feet of altitude and the check airman thought that was acceptable.
He learned what to expect, how severe the condition can be, avoidance, and what happens to the ADI when the simulator rolls over on its back.

They were briefed on recovery techniques beforehand. Initially, keep the airplane upright. If it gets to a certain point, continue with the roll, with as much aileron as possible. Keep control pressure (back pressure) on the yoke until 90 degrees. Then relieve the back pressure during the roll. When upside down, push forward on the yoke while using the ailerons. Advance power during the initial stage unless there is a nose low attitude when power would be reduced. Airspeed is as required. He stated that he did not fly acrobatics. He had never inverted a piece of equipment.

Two of the legs were near maximum weights. The others were lighter. There was nothing abnormal about the flights. When landing in CVG he used 25 flaps. The flaps were never selected to 45 during the 4 legs.

He was aware of the fast/slow indicator when slowing. At 150 knots and at a high gross weight, the airplane would not be clean. Within 3 miles of the final approach fix configure the airplane, gear down, condition levers max, flaps 25, standard configuration. The final approach speed slowed from 150 to 130knots.

The wake turbulence he encountered during an approach may have been from a B-737. He said he was 3 ½ to 4 miles in trail and on a parallel runway. Some controllers do fly you through the final approach course.

He has had problems with the auto-pilot capturing the localizer due to a bad intercept angle.

On exiting the accident airplane in CVG, his head or shoulder hit the deicing boots timer switch. A chime sounded and a light came on indicating abnormal deice operation. This was proper because there was no air pressure on the airplane indicating the deice system failure warning was operating properly. This would be a normal indication. He returned the switch to the middle position which is "off."

He stated that once the engines were started and up to speed, the propellers were not slow or abnormal coming out of feather. The tests of the auto-feather and manual feather were satisfactory. There were no abnormal indications.

Charles A. Briggs
COMAIR Captain EMB-120

Bill McHugh, ALPA attorney, was present.

He stated that he was hired by COMAIR on November 11, 1989. His total time was about 8,200 hours with about 400 hours as captain on the EMB-120.

Captain Briggs stated he had flown with the accident first officer only one time which consisted of 4 legs. He knew the first officer casually from social functions that they had both attended the last year. He described the first officer's personality as happy and content, smiling, jovial and as having fun. He said the first officer was not married. He said the first officer related his interests in stonework and that he had a "hot rod." He was very talented and was a "tinkerer". He was a contented and happy person and not the type to complain about the company. They flew 4 flights and had split flying the legs.

Although Captain Briggs considered his professional exposure to the first officer as being limited, he knew with 5-10 minutes of flying with him that he would be skillful. It would be a good afternoon. He considered him a "co-captain" rather than just a first officer. He was favorably impressed and would be glad to fly with him and considered him to be in the top tier of pilots he had flown with.

Captain Briggs stated he did not know how the first officer liked flying the EMB-120, nor did he know if he had any concerns about the airplane. He did not know about his flying background, but he thought it had been at the COMAIR Aviation Academy.

On the day of their trip together, they had flown in minimal instrument conditions and had flown only visual approaches. The four legs they flew together, were two round trips to Chattanooga, TN (CHA). The first officer flew the first leg to CHA and Captain flew the next two legs. The first officer flew the last leg. Captain Briggs stated the use of the auto-pilot by the first officer was about the normal amount of usage, that he had hand flown the visual approaches and that he had no concerns about his airspeed or altitude control. He had no worries, the approaches were "right in there." Captain Briggs had no concerns about his hand flying and there were no problems with him that day. Although Captain Briggs could not address his system knowledge, he said he was very thorough and methodical with the checklists and its usage.

Captain Briggs said he was not pushy or overly assertive, that he was on his own level and considered any experimentation with the airplane to be out of character. He was a person of high integrity. He said the first officer would definitely not experiment with the systems of the airplane and that he was procedurally oriented. Captain Briggs said everyone that he flew with at COMAIR was procedurally oriented.

Captain Briggs remembered the first officer hand flying the visual approaches. He flew the approach to CVG from downwind to base to final and he flew it well. This flight was not

delayed by vectors because arrival traffic was fairly light. He could not remember if the first officer had configured flaps 15 on base. He stated that there was not a minimum airspeed for selecting flaps and typically was done when the glide slope came alive on final. He said airspeed limits and configuration is left to the flying pilot. It was normal to intercept the glide slope clean at high gross weights, and never had a problem.

Captain Briggs said the first officer had not mentioned EMB or unusual attitude training to him.

Captain Briggs had been a captain in the EMB-120 since June 1996 and could not remember unusual attitude training but did remember windshear training. He said they encountered no turbulence on their trip together, that it was fairly smooth and encountered only occasional light chop.

Captain Briggs said he never had to make recommendations or influence the first officer on his flying.

When asked if he would be comfortable on a 20 mile final at 150 knots in a clean configuration, he stated that it would depend upon how ATC was handling the flight. A high gross weight for landing doesn't cause a problem with flaps 15. To be at 150 knots and to be vectored is fairly unusual. Those speeds would normally be on approach and in most all situations he would be at flaps 15.

When asked if the first officer would have asked for flaps in this situation, he could not say. He had not heard any comments from other pilots regarding the first officer.

Captain Briggs knew the captain and may have flown 2 legs of IOE with him. The accident captain was the instructor in the right seat with him. He was helpful, easy going, and knowledgeable. He flew with him in the Metroliner on the IOE, in Orlando, FL.

They both had transferred to CVG and since then had only casually said "hello." Comments from other first officers indicated that the captain was knowledgeable, well liked and worked well with all the employees of COMAIR.

JANUARY 14, 1997
COMAIR OFFICES, COVINGTON, KY

Richard St. Onge, Jr.
COMAIR Director of Operations

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR.

He was hired by COMAIR in February, 1985, as an EMB-110 F/O. He now has 5,500 hours total time. He has not flown the EMB 120 and is not rated on it. He is typed in the EMB-110, the Challenger, the RJ, and the SA 227, and currently flies the RJ. He was an FO on the Saab 340 and became the Director of Operations in 1994. He was a check airman on the SA227 and a designated examiner on that airplane for a brief period. He had been an SA-227 instructor, then became the program manager on the -227, then when the RJ purchase was announced, he was made the program manager for that airplane. After the airplane had been on line for a year, he became chief pilot, then DO. His predecessor has left for another company. He had a chief pilot in FLA and he has hired a chief pilot in CVG.

The split in the division of duties between himself and the previous DO was that when he became chief pilot and DO the predecessor then dealt with program managers and training, with his title changed to Director of Aircraft Operations. His predecessor oversaw the chief pilots. He, the present DO, now oversees the Senior Chief Pilot who then oversees the 4 chief pilots, two in each domicile, CVG and MCO.

Both chief pilots in MCO are EMB 120 qualified. The four RJs in MCO are flown by CVG pilots. One of the CVG chief pilots is RJ rated and the other is EMB-120 rated. Now that they have created the Program Manager positions, the chief pilots are not airplane specific.

The MCO chief pilot was changed since he took over. He wanted someone with more energy. The CVG chief pilots were people he put in. There has been no turnover since then, except for the one in MCO.

Most of the hiring and screening of new pilots is done near MCO so he wanted a chief pilot down there to get involved with that.

COMAIR Aviation Academy does the screening. Applicants are screened and interviewed by them. If they pass they go into a pool. The airline then asks for applicants who meet their qualifications and are selected from those within the pool. Applicants get an initial interview at the Academy. They do background checks, simulator evaluation, written testing, including profile and aeronautical knowledge, then COMAIR will pick the people they want to interview.

There are several avenues through the Academy to be hired. One is the Airline Qualification Course (AQC), someone who can go right into the right seat of an airplane that COMAIR flies, based on background, experience, etc. Another route is to become an instructor at the Academy, at which point, after about a year to a year and ½, they then can become qualified for consideration. The COMAIR academy is part of COMAIR holdings, not the airline. The Academy also screens for other airlines as well.

Minimum standards are lowered for Academy instructors because they know them better. They only pick the better applicants to serve as instructors. They will instruct for a year to 18 months, at the point that they have the qualifications, they go through the same interview, although they know them.

Rick St. Onge does not have responsibility for oversight of the Academy.

Once an applicant from the pool has been selected by the airline, they are offered a position, pending successful completion of the training at the Academy. The training is done in one of the airplanes the airline flies, either the Saab or the EMB-120 as a FO. Not on the RJ and not as captain. Then they join the airline and must complete the IOE position and they become line pilots. IOE are FAR minimums, but they must meet proficiency requirements, determined by the person administering the IOE.

Minimum qualification for employment are 1,200 hours total time and 200 hours multi-engine time for those who are selected from the pool. For instructors, required qualifications are 1,000 hours total time and 100 hours multi-engine time.

Currently COMAIR has about 850 pilots, most are based in CVG, about 200 are based in MCO. Pilot turnover was low in 1995, close to 0 percent, and in 1996, Rick estimates 3 to 5 percent. Last four months it has gone up to about 10 percent. This is attributed to the fact that the majors are hiring very heavily right now.

Training facilities are in CVG, with some in MCO at the Academy. They use sims at other facilities, but use their own instructors, including at the Academy. Captains. must have 3,000 hours TT to be considered for upgrade. This can be waived, however, the requirement has not been since 1987.

FAA observes quite often. Most recently they saw some rejected takeoff [RTO] problems in the RJ, so they increased emphasis on them. Also standard callouts were noted as a problem. They have good relationship with POI, he is not afraid to speak out and if he sees a trend will not hesitate to tell them about it and they will act to correct it. He cannot think offhand of problems with the EMB-120 that the POI has called to their attention. There have been no enforcement actions that he can remember. There was some enforcement actions arising from a prior (around 1980s time frame) NASIP. Last NASIP was in 1996 and only minor operational problems were found. The POI visits the facility about 2 to three times a month, if not, the CVG facility will visit others as well. Also

other FAA inspectors work for him and will do their own inspections and observations. POI is rated in the EMB-120 but Rick is not sure that he is current.

The company had not used voluntary disclosure that he was aware of. He guessed that the POI had been there since 1986-1987. COMAIR liked the POI and would characterize the relationship as very good.

There is a constant flow of information between the FAA and COMAIR. There is feedback after each evaluation. Whether the feedback was from the check airman, during IOE, comments from other inspectors there is constant monitoring and exchange of information

COMAIR has had a safety office in operation for two years, run by Ken Marshall. About two months ago he became VP of Flight Operations so he continues to run the Safety Department until they hire someone to fill that position.

COMAIR has regular safety meetings, but he cannot say how often. Delta has regular Safety Partner meetings, and COMAIR has its own regular meetings. The company sends out safety information to its pilots regularly.

The company has a line check airman program where the line check airman, program managers, proficiency check airman and instructors meet at least quarterly. The idea is to have the line check airman learn how they are doing. They also seek to obtain a high level of standardization and these types of meetings help to ensure standardization as well. Instructors and check airman will also get together frequently. They will look at the things that the check airmen are seeing to ensure that the pilots are standardized and operate the airplane as the airline desires. The frequency of the meetings depends on the types/number of problems noted. Rick observes the meetings when he can; he does not attend every one. Much of the discussions are procedures vs. techniques. They are firm on following procedures but want to allow individual techniques. They do not write techniques in the "book" or manual. There is no defined section in manual on techniques.

They hope to have procedures similar across aircraft. The airline is moving to a two airplane fleet and they are trying to have procedures in the EMB-120 as close as possible to the RJ. They were going to change the RJ checklist tomorrow (1/15/97) but that has been put on hold. The commonality is very good but they are trying to make it better. A major revision of the EMB-120 flight standards manual was planned but it has been put on hold because of the accident and the need to get everyone in the right frame of mind. The revision was major and required getting check airman to fly with the pilots, and other activity. Right now, it is on indefinite hold until they think the time is right.

They will provide whatever training they can to get someone to meet proficiency, but if they believe someone cannot meet the standard, they will not permit him to fly for them. This policy has always been like that. He estimates maybe two pilots a year are let go because of poor piloting. They have people who did well in training but could not get

through IOE, they have had captains who were here for years but their piloting or leadership declined, often because of something else going on in their lives. Some cannot progress to captain because they do not have the leadership skills.

COMAIR switched to computerized records in 1992. When they went through the computerization process they applied the record keeping methods back two years, as well as initial training. Old records were kept for two years then discarded. Substandard performance is documented by instructors. Someone who is having trouble at stages of instruction is not passed through to the next level. If this occurs they will bring ALPA into it. If someone is let go it will usually go to arbitration, but he is not aware of anybody coming back to the airline after being let go for piloting issues. They will not make a decision just based on one person's opinion. They will have an evaluation ride and get several people's opinions. The airline and ALPA work closely on this and rarely disagreed.

He knew the accident captain very well. He has known him since about 1991. The DO was the SA-227 program manager at the time and he became a SA-227 line check airman. That is how they first met. He does not think that they flew together. He does not remember if he ever gave the accident captain a checkride.

The accident captain was domiciled in FLA at that time. He was an absolute genius in mathematics and had several patents. He did extraordinary work in the military with GPS. He did a lot of performance work for them, runway analysis work, including work on the RJ both before and after purchasing it. He specifically helped Rick in the implementation of the RJ by automating the weight and balance programs on computers and writing performance section on the RJ for the manual. The Bombardier performance engineers did not know as much as he did on performance. Shortly thereafter he became a full time RJ instructor, March 30, 1994. He was very well respected and regarded as an instructor. Very detail oriented, professional, and serious about his job. He never received negative comments about him from FOs or other pilots. In December 1995 the accident captain returned to the EMB-120. His goal with the company was to head the performance engineering department, but the company was too small for that at the time. He returned to the line after his last performance review, which was good and complimentary, however, he thought that he should make more money based on the work that he had done for the company. There was some disagreement between him and the company, primarily the captain and Rick and the RJ program manager.

The day of the accident Rick walked upstairs with the accident captain; he was planning to transition to the RJ in February and had talked to the program manager on the RJ. He talked to him about going back into the training department. The year apart seemed to dissipate whatever anger he may have had. There were some hard feelings but they only lingered for a month. His expectations and Rick's were different. He was a full time instructor who also did performance work, with the hope that he would head a performance department, but that did not materialize. He was a true professional and did his work without speaking badly of anybody. He got over it.

Rick and Dan did not socialize together. He did not know the FO and had not heard any comments about him before the accidents. Since the accident, he has only heard positive things about him.

He believes that the airplane stalled and he cannot understand why they did not recover. They have stall maneuvers in the manual and in the type rating ride. Applicants are tested on this as well. They also provide unusual attitude training. The captain was provided with this training and tested on it in his last check ride.

They are working under single visit exemption for all airplanes. AQP is not established on the airplanes. The RJ will get it first, now it is 99% done for AQP. Some of it has already been implemented on the training. On the EMB-120 task analysis has been done and they are working on ground school and sim sessions.

He cannot say why the hiring method was changed. The academy screened for Great Lakes Aviation and one of the American Eagles. He is not sure what other airlines have used the academy as well. He oversees the hiring criteria. He is looking for the highest qualified pilot they can get. One with very good scores in the technical exams, ex-military, corporate, or regional experience. Applicants pay about $10,000. He does not believe that this cost detracts from the quality of applicants. They are getting the "cream of the crop." They are still getting 1200 hour or more total time pilots. He attributes this to COMAIR's reputation, and the quality of the company. Mesaba, and possibly Skywest, do not require applicants to pay for individual training. He has met with ASA and others to discuss this. Ken Marshall has had this discussion with ASA and Skywest

The people that they get are very motivated because they have an investment. He said he liked being an instructor there it because the pilots were very motivated to do well. He does not know the proportion of applicants that get placed in the pool

When the POI made comments about the student's progress, meetings were held with the simulator instructors, and coordinated with the ground school. The recurrent program could be addressed the same way, or in many different ways. COMAIR is separate from Delta. Several years ago, the different Delta Connectors would get together with Delta to discuss problems. Most recently, the Delta Safety Partnership was established. Delta owns 20 percent of COMAIR.

Upgrading captains must have the ATP written, 3,000 hours total time and 500 hours with the company and 1,000 hours multi-engine. Upgrading is seniority based once someone meets the criteria.

Record keeping was changed in 1992. They had 400 to 500 pilots. In his opinion with that many, over 200 to 300 it becomes too cumbersome in terms of paperwork. The new method allows you to make projections. You lose instructor comments in the new system,

but if a person is proficient and signed off by the company and the FAA, that is what matters.

They have an FAA approved winter operations program, which is part of the initial and the recurrent training. The company does hands on training for all ground deice people.

Cockpit Resource Management (CRM) was started in 1992. Dave Harris, who had been involved in Northwest and United Airlines, had worked with Helmreich. He developed the CRM program, and did pilot surveys. NASA was involved in the surveys both before and after CRM implementation. Pilots will now see CRM in every checking and training exercise, based upon the 1992 program. Jordan Brooks is the CRM coordinator, and a line pilot. The idea was to have a line pilot teach it.

He said he is not aware of procedures that are bent by pilots. If someone is having problems in piloting or training, the chief pilot will generally talk to the person to find out if other problems are there and will try to work it out that way. The company tries to keep instructors and check airmen out of this process. Depending on the situation, he and the chief pilot will determine the type of action needed. They may change instructors. Contractually, if someone fails two checks they are returned to previous position. If someone fails they are retrained to proficiency.

Probably a year ago was the last time the academy placed pilots with another airline. The last time was with Great Lakes.

In 1987, the 3,000 hour requirement for captain upgrade was waived. At that time the airline was doing extensive training.

Instructors that come from the academy have to meet the standards of COMAIR. The company has rejected some of the instructors at the academy, but less than 2 percent.

Rick was honest with the captain in telling him that a performance department was a long way off and he tried to be clear that his job was to be a full time instructor. He said, "there was no carrot hanging out at any time in regards to the captain." Maybe in his mind he thought otherwise.

There is a high accountability for the instructor if a student fails. "Job Aids" are used to track student's progress through the program When a student completes training, the job aids are discarded, when the record is completed.

JANUARY 15, 1997
COMAIR OFFICES, COVINGTON, KY

WILLIAM BRUNDAGE (Telephone conference)
COMAIR Regional Jet Captain

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR.

He has been with the company for 12 years. He started the Florida division in 1987, and was based there for 6 years. He then moved to CVG.

He transitioned to the RJ. His total time is about 10,000 hours. He had flown the EMB-120 as PIC, and he had about 800 - 1000 hours on it because he was in management at the time he was flying it. He had also flown the EMB-110 and the RJ. He last flew the EMB-120 about 2 ½ or 3 years ago.

He knew the accident captain in strictly a working relationship. He specifically remembered the accident captain gave him a pre-briefing for the type ride when the captain was an RJ instructor. Also he gave him aircraft training and gave him his next to last proficiency check in the RJ about 1 ½ years ago.

He did not remember the captain as a particularly talkative instructor. He would point out problems after the fact. He would make sure that he explained to someone a problem until the student fully understood. He was not intimidating in any way. Very thorough. He felt that he learned an awful lot from the captain in the checkride that he administered. They spent some time doing unusual attitudes in the checkride. This was just after the US 427 accident near Pittsburg. Everyone was sensitive to rudder problems and they simulated PCU runaways on the rudder and on the ailerons, and how to handle jammed ailerons. These simulations caused the airplane to go into unusual attitudes. They discussed whether to continue the roll around or to reverse the direction of the roll. It was dependent upon the roll rate. He was trying to get you out of the natural reaction to roll back. Emphasis was placed on the position of the nose once the airplane was inverted and the amount of forward pressure that was required for level flight. He talked about power but could not recall what was discussed.

At one point they actually rolled the simulator and flew the simulator upside down. Captain Brundage was surprised how much forward pressure was needed to maintain level flight. He believed that if he had completed the maneuver correctly the first time, he would not have gotten the additional training.

The last time they flew together was in a recurrent check about 1 ½ years ago. He was not particularly talkative in the simulator. If he wanted you to know something in the simulator, he would stop it and talk about it.

He had not heard anything about the captain from other pilots that had flown with him. He had no personal contact with him other than casual greetings. He had a good reputation as a pilot, and had a good demeanor. The last time he saw him was a few weeks ago. It was a casual greeting.

Does not remember discussing icing during his proficiency check.

He would let you make a mistake. For example, they were flying an ILS approach (in the airplane) and he put his hand on his shoulder and pointed out that his hand was not on the yoke.

He debriefed the student's CRM skills. That is a required part of their training. He did not remember anything specific about that.

JANUARY 15, 1997
COMAIR OFFICES, COVINGTON, KY

ROBERT M. HARLER
MANAGER OF TRAINING

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR.

He spent over 21 years in the Navy. He started with COMAIR in 1990, and flew the line for about 2 ½ years, but not in the EMB-120. Was in the RJ development and training program for about 2 ½ years, then went into training, but did not fly the RJ in line operations. He flew the SA-227 in line operations, as an F/O. He has about 6,000 hours total time, with about 2,200 - 2,300 hours total time with COMAIR. He stated that he had never flown the EMB-120.

At COMAIR, they operate under a single visit exemption for recurrent training as they progress to AQP. Initial training is done under traditional methods. The FARS and FAA Order 8400.10 contain guidance for training and the 8400.10 explains the regulations and gives guidance. The next tier of information, under that, is to take the regulations and the 8400.10, and other sources of guidance, and produce the company training manual. A thick three ring binder, contains guidance for each of the aircraft, instructor/check airman training, as well as F/As and dispatchers.

He also oversees the computerized record keeping, training, and simulator scheduling for check airman, instructors and students. At the end of training, he assigns students to duty. He also schedules recurrent training, and coordinates hotels, passes, invoices and other administrative needs. He helps the PMs with curricula.

The next tier is to take what is in the training manual and each of the program managers converts the information for use in training. They oversee instructor and check airmen, and the Manager does the scheduling.

He spends as much or more time on the phone with the POI; a couple of hours a week. More than anyone else in COMAIR flight operations. He has a very close, very good working relationship with him.

He became Manager of training in late 1994. In early days of the RJ program in early 1992, he was not the program manager on that airplane. His relationship with the POI did not start until he became the Manager of Training.

Most of his dealings with the POI involve the overall training program, changes in the FARs as they affect the program, check airmen, etc. Interactions include situations not in the regulations such as downgrading from PIC to SIC. Specifics on airplanes are handled

by the program managers and the POI. If changes are across the board he will incorporate them in the manual with the POI's concurrence.

Downgrade training occurs when airplanes, such as SA-227, are phased out and the pilots must be moved out, sometimes into the right seat, if seniority warrants. The company wanted to make sure that they were comfortable and fully qualified to fly in the right seat.

The POI or their assistants are in the offices at least once a week. POI a little less than assistant (Doug). They have sat in on recurrent training, initial. Doug has gone through RJ training, as well as EMB 120 training. Steve has gone through recurrent with them.

During the 2 years he has been Manager of Training they have gone from revision 6 to Revision 15 in the manual. Most of these changes have originated from the POI or from the FAR revisions. Every time he talks to the POI, he will note a comment or suggestion and put it in the next revision. There were no disagreements. They worked well together and if he went to another airline he would want to have the same POI. He has not seen voluntary disclosure to the FAA in his capacity as Manager of Training.

The last NASIP was in October 1995. There were 4 findings in his area, all minor and all corrected. He had no knowledge of violations or letters of correction for the training department.

He does not meet with the instructors regularly. The program managers meet with them regularly. They supervise the instructors. They have quarterly line check meetings with line check airmen and periodic meetings for standardization for all. COMAIR program requires annual recurrent meetings with the instructors, not an FAA requirement.

All simulators are dry leased. They have a EMB-120 simulator in CVG, as well as other locations that they use. CVG is a level C simulator. He believes that there is an EMB-120 level D simulator.

He does not monitor the ground school. Program managers do development and administration of their own training. There is unusual attitude training taught on the EMB 120. It has been taught since the Roselawn accident, and is taught at the end of the SVE [single visit exemption] training in the simulators. There is no formal syllabus in this training, it is left up to the instructor as to technique. Such training is not required by the FAA. It was instituted because of the unusual attitude following the Roselawn accident.

The simulator is put into an unusual attitude and the pilot must recover. The event is a roll, wake turbulence upset.

He does not know what the recurrent failure rate is on the 120, on the RJ it is less than 5 percent. One aspect of the single visit, and AQP is the data collection. They collect deidentified data on pilot training/checking performance and send data to FAA HQ monthly. The data includes number of people went through training, the number of people

who repeated (or failed) and the ratio of the repeats to total number. The 120 repeat rate is very stable and has been this way for a while, he believes that it is no more than 2 percent, likely less. No peaks or valleys. In the RJ they found a problem "spike" with RTOs. They recognized that something had to be done to improve training and standardize procedures, then it leveled out again. These are not mandated.

Data collection is a very important part of the AQP program. They have developed a Windows based program to automate this.

Each airplane has a flight standards manual that specifies the stall recognition and response procedures. EMB training is stable. They train to proficiency.

AQP is a good way to go help tailor the training to the way the airline flies and to the equipment it operates. Also they can identify an area that needs additional training and provide the emphasis needed with concurrence of the POI and AFS 230. So this provides flexibility. AQP is being developed now.

The old training required a type rating equivalent every 6 months. SVE emphasizes crew oriented training, and they are assigned to fly an LOE as a crew, deal with problems as a crew, then spend 2 hours debriefing and viewing video of their performance in LOE. They also emphasize CRM. After this, they go into simulator for proficiency portion.

COMAIR training is better than any program he went through in the Navy. The Navy offered a slower paced program that features more hands on time with the maintenance people teaching systems and airplane equipment. This was a long time ago. COMAIR'S is more sophisticated. They use simulators and computer based training systems. He cannot compare COMAIR to Navy programs.

A person who goes through training is then typed or signed off, and is assigned a check airman to do IOE, 25 hours in RJ and 20 hours in turboprop. The time can be reduced in the turboprop. Captains will be observed by FAA and they will also receive a line check. When these requirements are met they will be assigned as a line pilot. Six months or less after that they will get another line check, 6 months after that they will go through SVE, so every 6 months every captain is observed. F/Os are evaluated every 12 months through SVE. Line checks are administered by chief pilots office in the month he is due.

Feedback will generally go to program managers and periodically will get contact with check airman. Feedback generally is when something is out of the ordinary happens, generalities about someone's performance.

This year, 1996, he estimates that there will be maybe 10 new check airman, some replacements, some expansion, fewer instructors, based on a total of instructors and check airmen of about 100. This is less than previous year's rates.

Check airmen selection procedure is initiated by program manager in contact with person who expresses interest. The chief pilot is involved. When concurrence is reached Bob gets involved. Pilot submits resume of his experience, with licenses and he sends a letter with that information to the POI who checks the name on the PTRS system, then the person will enter training process.

The instructor process is generally similar. They usually know people well. He has not vetoed anybody. As a group they have vetoed people. This does not happen often, maybe 2 to 3 times a year. This is very informal. Maybe a perception that the person would not be a team player or would have the right attitude, would be more of a burden to the program than help.

They want people with good technical knowledge, good piloting too. Self motivated, self starter, someone who has initiative. Someone willing to spend much time away from home and can present themselves in front of group.

He had a lot of respect for the accident captain and his abilities. He did not know him as instructor in the 227 but knew him fairly well in the RJ. He was working in ground training and the captain was working in performance. Probably taught him in ground school. Captain was a borderline genius. Never flew with him.

The captain's downgrade was not extremely unusual but it happens every so often[1] . An instructor or check airman puts in a lot of hours and every so often someone believes that flying the line becomes attractive.

Attended some parties with him where he was present. Helped him move from Florida. Was a very nice person. Very upbeat. Everyone in the office liked him. One of the most upbeat people he knew.

He and his wife seemed to get along better than most. Without children they could focus attention on themselves.

He did not know the first officer.

Dan's area of expertise was software and performance data on the RJ. Bob was only an instructor pilot at the time so not familiar with what management thought of him.

Part time instructors can be pulled off line for a week, 2 weeks or a month. They will be compensated for 30, 60 or 100 hours depending on which of the 3 categories pulled off. Full time instructors are compensated according to personal negotiations. Check airmen pay scales also depend on whether they are full- or part-time.

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[1] Under terms of the Air Line Pilots Association (ALPA) contract, an instructor who leaves the training department must bid to fly an aircraft in accordance with his or her seniority. In this case, the captain elected to bid a Cincinnati based EMB-120.

Not aware of norms performed outside of what COMAIR teaches its pilots.

His predecessor was Wayne, temporary predecessor in that position. Permanent predecessor was Bill Brundage, then Dave Harris, then Ron Allari.

EMB 120 Initial training is about 24 hours in sim, transition training is 20 and upgrade 16. Table 3.2.6.1 and 6.2 in training manual 8400.10. RJ program is 36 hours. He does not know what the other airlines do.

Some instructors were hired off the street. He can think of 2 for the RJ, one came from the manufacturer. On the EMB-120 he can think of 1 person who came from Westair. These guys go through recurrent each year and must comply with applicable FAR requirements regarding their training and requirements for line observation, participation in company recurrent. They are not line qualified.

F/Os not required to go through line checks but they are observed and evaluated in SVEs. An SIC can get evaluated in SVE a lot or a little depending on the number of captains they get paired with. Again they are not required to get line checks.

The qualification process, they are observed IOE, then get a traditional line check with the check airmen in the right seat. Next line check done in accordance with the SVE program.

Less than 10 percent of the instructors are full time although this is no reflection on their competence. Just a reflection on their compensation. Many do instructor and check airmen duties. No qualification stigma to being full or part-time.

In many respects their training program exceeds the requirements.

JANUARY 15, 1997
COMAIR OFFICES, COVINGTON, KY

RONALD L SODAM
SYSTEM CHIEF PILOT

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR.

Has been with COMAIR since 4/85. Not flown the EMB 120

Has 16,000 TT, Rated in the SF 340, the CL 65. 7,000 TT in the 340. Appointed Chief Pilot in 11/94 and System Chief Pilot in 4/96. He replaced somebody as Chief Pilot, that person was promoted to DO. He plays a role in direct management of pilot group. Oversees 2 Chief pilots each in CVG and MCO. About 860 to 870 pilots. The company and pilot group has grown. In 11/94 believes about 650 pilots were around.

There was very minimal pilot turnover until last 6 months. Since then about 25 pilots left the company for other jobs with the majors, including Fed Ex and UPS. In the past year 3 pilots were terminated, 1 due to proficiency and 2 due to discipline problems. No outstanding or animosity with the union based on these terminations. He believes there is an excellent relationship with the union and with the POI.

He doesn't meet with the POI on a scheduled basis, but does talk to him or see him about once a week. Normally conversations concern proficiency problems. He sometimes hears about airplane related returns to airports and POI will call and ask about it and determine whether pilots have followed up with appropriate paperwork. No NASIP findings pertinent to him as chief pilot. No disagreements with the FAA.

Knew the accident captain from association with COMAIR and they both worked together as instructors in the RJ training program. Never flew with him. Was made aware from other pilots, word of mouth, about the captain was that he was an outstanding instructor and competent pilot. Has not heard anything negative about him. Knew little about his personal life. He liked living out in the country.

Never had a pilot come in to talk to him about the captain, as pilot. As instructor a pilot came in and told him that the instructor was excellent and that person did not think he could have gotten a better instructor.

He did not know the F/O. One pilot reported to him about the F/O. That captain reported what a good job the F/O had done.

Does not recall the complaint that the captain filed on the F/A.

Ron reports to the DO. He meets with the chief pilots monthly, but talks to them daily. Monthly meetings are not scheduled but this is what it works out to. Part time instructors fall under program managers, insofar as their instruction is concerned. He oversees line check airman. He gets involved with instructors if their is a conflict with other instructors or for scheduling concerns.

As far as check airmen, he gets involved in just about everything. The program now for IOE and line checks is pretty refined and check airmen are comfortable with it. He tries not to get involved too deeply in training. IOE and Line check airmen are used as a cross check for training. He likes to use them to listen to what they tell him for what it says about standardization of instructors and quality of pilots. If needed, he will tell program manager that they need to focus on something. If needed, he will go to them. Generally very minor things, such as RJ pilots to keep the landing lights on higher during descent.

Generally, the demand for pilots has increased and the quality of pilots has decreased somewhat. For example, when Ron was hired he had over 5,000 hours and had an ATP. Since then, especially in the past 2 years, the total hours experience level of new pilots has gone down. They don't get 5,000 hour pilots anymore.

They get pilots from the Academy, who generally have 1,200 hours. And they get pilots from AQC, generally very experienced. Right now the company is getting pilots from the Academy in the 1,000 hour range. He does not believe any pilot comes to them with less than 1,000 hours. He does not believe that the training program has been modified to meet the newer level of pilot. They will not put a pilot on the line until that pilot and everyone else is satisfied that he/she is ready to go out there. Train to proficiency and to a confidence level appropriate to that level. He has watched this closely with the IOE check airman. If the pilot not comfortable, give him/her what is needed to feel more comfortable. They will do what it takes to get the confidence level up.

The only complaints about the EMB-120 is the prop AD and the potential for prop overspeed. Typical pilot comments such as "I wish they would put a different prop on it." There have been reports regarding prop RPM being a little off, almost always an indication problem.

There have been some engine shutdowns; maybe two or three in his tenure as chief pilot. One was an oil pressure problem that was nothing unique to the airplane. He does not recall any more than that. There were no reports regarding air speed indications, differences in airspeeds, or stall warning indications.

About 50 percent of his time is administrative, 25 percent is dealing with pilot issues, anything from administrative to disciplinary, performance, remaining is miscellaneous, such as setting up pizza in pilot lounge. He does not routinely attend the daily morning briefings.

3,000 hours of his initial time was flying turboprops for commuters, and first the 2,000 was GA flying.

Reviewing the flight standards bulletin is mandatory.

He was not familiar with the bulletin that was issued following the AD, regarding disengagement of the autopilot in severe icing conditions, below 170 knots.

Normally, if someone was not following a restriction, eventually he would hear about it from other pilots. That restriction is mandatory; it's a Bulletin. He does not know if icing conditions are simulated during the SVEs. In the last 6 months, maybe twice, pilots came to him and complained that other pilots were not following procedures. They would then talk to the other pilots who had flown with that pilot, review his or her records, and maybe follow up with a line check or proficiency check.

There would be records in the chief pilot's personnel file and in the Human Resources department regarding these pilots. The ALPA contract permits disciplinary information to be retained for 2 years after which they should be purged.

He jump seats on the line every couple of months.

He knows that pilot groups know to follow bulletins. Line check airmen will ask pilots before line checks several questions, these will include questions about bulletins to assure that they are following them.

That bulletin referred to as Winter Flying Tips Flight Standards Bulletin 96-02, refers to "severe icing conditions."

Complaints by pilots about other pilots do not necessarily result in written material about the complaints being placed in a pilot's file. Certainly nothing will be written without first a discussion with that pilot. He has directed the chief pilots to do this. It forces the chief pilot to first talk to the pilot. It also is the right thing to do. A pilot not following procedures is a serious matter that they address. It also raises a CRM flag regarding a breakdown in CRM.

The Bulletin says that all procedures set forth in the manual will be followed. The blue addition to bulletin is there because they are soon to revise the manual but they need to get this in before the revision can be done.

They have a winter operations ground school which discussed the use of flaps, autopilot, and need to monitor trim. They were more restrictive than the AD which restricted speeds to 160 knots; COMAIR made it 170 knots.

He will talk over problem with check airman if there is a problem with pilot such as not being able to answer questions of the line check airmen, basically memory items and

bulletins or if they see a pilot on a line check who is not up to standards and gets behind on an approach, and if necessary will take a pilot off line. This is a rare event and does not happen often These questions generally occur before line check, but can happen afterwards. It is possible that crew was unable to answer about limitations when asked afterwards. They don't hesitate to pull a pilot off line, they have done it many times for all sorts of reasons.

May not be aware of FAA violations against pilots. Every 6 to 8 weeks, he may get a calls from an FAA inspector about a particular flight. On followed-up, they are often a result of a misunderstanding. Maybe 3 to 4 times a year there will be pilot violations. He does not hear about all of them. He is unaware of any in the last 12 months. In the last 12 months, there were 2 or 3 letters of warning, which are purged after 2 years.

Pilots get a few days to no advance notice about a line check. Usually no notice. They are asked questions on limitations and memory items in an oral type setting. He has pulled a pilot off the line after a check airman asked questions on procedures and proper answers were not given. It is a very rare event. The check airman tries to ask limitations before departing although it may occur after a flight.

Anything in bulletin must be followed, even if preceded by the word "Tips."

JANUARY 15, 1997
COMAIR OFFICES, COVINGTON, KY

RICHARD SYKES
COMAIR CAPTAIN/SAAB INSTRUCTOR
CAPTAIN/EMB-120 INSTRUCTOR

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR.

He has been off line as a part time instructor for 7 years. He is a part time instructor, in the Saab and the last 2 years, primarily on the EMB-120. He has also done EMB-120 courseware development. Qualified on the EMB-120 in April 1995, and wrote the new weight and balance manual for the company. He wrote the F/A manual, and wrote the initial deice manual, that has since been revised. He recently had been involved in revising the EMB-120 courseware. This is primarily the pilot training manual for the airplane. The most recent manual came out about 6 months ago, and is about 75 percent in common with the previous manual.

He flies the line as a Saab captain. 90 percent of his time is related to EMB-120 and 10 percent to the Saab. He is trying to get away from handouts and put as much as possible in the manual. When something is revised copies are made for all to replace so that way they can reduce the paperwork involved. In the new manual they have shifted some emphasis around to make it more operationally oriented. How a pilot is affected if things don't work right. He has about 30 hours in the EMB-120, and does not teach in the simulator; just the ground school. He has about 5,000 hours total time, with about 700 to 800 hours at COMAIR, mostly in the Saab.

He teaches ground school in the EMB-120. In the Saab, he teaches ground school, simulator and aircraft training. COMAIR has two types of instructors, part-time, basically paid as a line pilot, and full-time, paid as an instructor. As a line pilot, he gets a minimum number of hours. For almost 7 years he has been a instructor, but flies a line a week or two, but the last time he flew a line regularly was October 1990. He will fly when they have a break in training or need a pilot.

Most instructors are either primarily ground or aircraft/sim. It is easier to find those willing to teach flight, more difficult to get someone to teach just ground. Only two qualified and current in more than one airplane, one being the SF-340. Because they are being phased out this is unlikely to change.

He does not teach recurrent training now, although he taught it two years ago in Saab, never taught it in EMB-120. He uses flight standards manual and flight training manual as his guides.

When they made training more operationally oriented, they took much material that was engineering oriented out, but did not reduce the time involved. Much training then shifted to CPT. They then reemphasized it to how airplane flown, checklists followed, etc. At the end of the day they will devote last two hours to procedures that would be done in the simulator. When the turn knob is used, bank should not exceed 30 degrees, plus or minus 3 degrees. Pilots rarely use the turn knob. When using the heading knob the bank angle should not exceed 25 degrees, plus or minus 2 ½ degrees. They teach them to use the heading knob for everything. Pilots do not use the synch button very much but they will use it in the coupled miss approach. There are rare instances in which you use the sync button. The EMB-120 has an auto-pilot with more modes, this was not the case in the Saab.

There is a limited amount of rudder control, no automatic trim for the yaw damper. He teaches pilots that when hand flying must keep one hand on yoke at all times. When autopilot flying can put hands on other things.

If the airplane was trying to bank more than 30 degrees, the servos would try to prevent that so that their limits would not be exceeded. Does not mean that bank would be prevented, just that servos would increase pressure in attempt to stop that.

They don't get into unusual attitudes much in ground school, that is covered more in the simulator. However, slides of extreme attitudes are shown when teaching the EFIS. For example, 70 - 80 degrees nose down, there are big arrows pointing to the horizon. They also discuss power control when upset to address pitch/power control awareness.

Regarding his own training, he did a few rolls in the jet upset profile with the simulator motion off. The emphasis was placed upon continuing the roll for recovery, as opposed to recovering with a "split-s" maneuver.

The students enjoyed the training. He said, the lesson plans for the Saab and the EMB-120 are almost identical but are airplane specific. Power control is taught. Pilots with acrobatic experience are usually better.

They also have wind shear models where they just press a button and can get wind shears presented that model different accidents, such as JFK, or DFW. Emphasis is to identify the windshear. For example, recognizing that the vertical speed could be zero on an ILS approach and no change in airspeed. That being a symptom. When you hit shear, they train pilots to identify the shear using airspeed, vertical speed indications and other inputs. Pitch up to 20 degrees nose up, edge of shaker, set max power, 110 percent torque. If still going down, firewall power, if ground contact is imminent.

They spend about an hour going over stall system and stall speeds. Basically use slow/fast indicator as a reference for approaches. They stress focusing on the speeds. If they do things right when they cross the fence they should be right at the appropriate indication. Not really taught to use to fly by, just taught as a reference.

Stall warning is off of AOA sensors. The stall warning system requires testing any time power is removed from the central bus. They teach what part of the stall warning system is lost with an electrical auto-transfer. Also, they teach the shaker and a clacker, an audible warning with shaker on the yoke. Each stick has its own shaker, two independent systems. If no correction and angle of attack is increased, eventually you will get a pusher, that is purely based on angle of attack. The only adjustment to the system will be side slip indicator which could indicate if the airplane is in a slip. If the stall warning systems alerts while the autopilot is engaged, it should disengage the autopilot.

They teach, in ground school, flying pilot will have hands on power levers, will set max power then the flying pilot will get on yoke and hold level flight. Will call positive rate gear up even if gear is up to get the callouts the same regardless of the stall. Landing stall, will do the same thing, but will try for positive rate climb, will raise gear and flaps as airspeed increases. When at 170 knots will call for cruise check. Pattern is gear up, conditions levers max, flaps zero and power will be set with non flying pilot fine tuning it.

In general, condition levers are set and not adjusted much during flight or in a training environment. If needed, i.e., if crash imminent, would push power levers to max. No restriction on power levers or condition levers movement regarding rapidity for normal operations.

Prop overspeed is the most critical maneuver they can face. It can do violent things to the airplane. May not even be recoverable, depending on the cause. Go through memory item checklist. Also rapid decompression will get your attention. Although they don't fly that high, despite the fact that airplane is certified to 32,000 feet. There should not be anything that pilot can do that can cause a propeller overspeed. If you bring power levers beyond flight idle it could cause overspeed but they drill it into pilots not to go near that unless all three gear on the ground.

Nevertheless, engines have EECs and HMUs (hydromechanical unit) that should protect engines. Props will respond as fast as they can. But still won't move as fast as pilot can move levers. Power levers and condition levers are only inputs into the system, since EECs and HMUs really control them, or at least act on the pilot's input.

He has written flight standards bulletins and is very familiar with them.

Does not know limitations off hand. No minimum speeds for flap extension that he can determine. What determines when to lower flaps is your position in the approach, intercept vector or on base. Minimum maneuvering speed of airplane is about 140, speed to not go below without being configured. Every so often they will have you slow down when you are out let's say 5 miles, but he would not do that without configuring the airplane. First flap selection is 15. Holding speed is 170 in clean configuration. They put out a bulletin early last fall, when Ads came out, they either recommended or required 170 speed. Not aware of a minimum speed for icing, in clean configuration. They use 170 as

the training speed in the sim. Put out two bulletins, one on winter operating tips and one on turboprop icing. If he is near those speeds he will start configuring. He would not fly at 150 clean, he would go to flaps 15, unless in icing conditions he may not want to put flaps out. He would tell ATC and stay at 170 knots. It makes it easier to fly if you configure.

He will not configure 5 miles out in icing, every so often in CVG will slow them out when far out. In a training scenario he will get on someone if they are going slow and not configured in the EMB-120.

He recommends no less than 170, although it is not written anywhere. He does not know if a check airmen has a basis to fail someone going below that. Bulletin came out since September and he attended two standardization meetings.

He interprets winter operating tips as required, not guidance. But it is possible that another instructor will consider them advisory and not mandatory.

Follow the arrows in an upset and the airplane should right itself.

TOLD cards not used in the Saabs. Not aware that TOLD cards in EMB-120 did note minimum configuration speeds but they were taken out. When Wayne got his type rating in the EMB-120 in 4/95 these TOLD cards were not used and he was not aware of them when he took over the program.

He did not teach the accident captain in the EMB-120. He was not a EMB-120 instructor in when the F/O went through ground school and he has not taught either the captain or the F/O.

AD 95-25-11 came about after the Carrolton, GA accident, teaches them to keep condition levers in min during all ground operations, when cleared for takeoff they will go into max. Power levers must be at or below flight idle, except for 5 second excursions. This has had the affect of sharply reducing single engine taxi operations in MCO where there is a hill.

If the slip vane fails, iced up or seized, a caution light will illuminate. This is an integral part of stall warning system. Stall warning will continue to operate but with this failure of slip.

He does not teach callouts on disengaging autopilot, but they do teach callouts on transfer of control. A chime goes off a few times when the autopilot is disengaged. They talk about 45 flap landings. That is used for all visual conditions. If more than 6,000 foot runway in IMC will land with 25 flaps. If less than 6,000 feet, essentially Key West, will use 45 flaps.

JANUARY 15, 1997
COMAIR OFFICES, COVINGTON, KY

KEITH STAMPER
CHIEF INSTRUCTOR EMB120

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Capt. Kevin McGreevy, ALPA; William Plessinger, FAA; Wayne Wolke, COMAIR

About 5,000 TT, 3,800 TT in EMB-120. About 1,000 as PIC. Joined COMAIR in 1990 as a FO, flew for about 4 years as FO. Became instructor and check airmen around Nov. Dec, 1995.

Knew the accident captain but not very well. They were in a recurrent ground school together but they did not socialize and they never flew together. Had only passing contact with him. He remembers that the accident captain was very knowledgeable in the ground school about the airplane.

Did not know the first officer.

He does not do airplane training, only simulator training in the EMB-120.

Captains come out of ground school with a very good knowledge of systems and are ready to apply it. The F/Os have good knowledge of systems but because of inexperience in line operations may take a little longer in the sim to bring them to the same level.

After ground school they take a written systems test which must pass before going to simulator.

Teach the course according to flight standards manual. They don't want students to find themselves icing conditions too slow and using autopilot. They want them to use vertical mode that gives them airspeed protection, IAS mode. In event that they are in severe icing turn the autopilot off immediately.

Train icing using Detroit, have them conduct approaches and then fail systems. The only speed for icing is minimum of 160, recommended to be 170, they train to use 170 in holding in icing, that is the standard they are looking for.

They teach them to use flaps 15 on base, and configure the airplane when one dot below to gear down, condition levers down, flaps 25. No modification as to whether in icing conditions or not.

The slow/fast indicator was only certified for flaps zero. They will learn the most about the information that instrument gives them is during stall training. They get the feel for where that is when the stall indicator alerts. As a rule they don't have them key on that on

approaches because at flaps 25, according to the manufacturer, the information is invalid. They don't want to see that indicator outside of center. When they are one dot low, the indicator will alert at stickshaker. This is not taught just there for reference.

The indicator is also covered in systems.

They spend a lot of time prebriefing stalls. Want the students to know how the airplane feels and what they should be looking for. They want them to know the calls and where to reach before they ever get in the simulator.

They teach stalls in all the configurations. They fly them to the shaker and then recover. At 120 knots they either roll into a left or right turn and stay in the turn until the shaker. Last stall is the clean configuration stall.

Clean stall they are taught to call flaps up, gear up, conditions levers max, set torque 15 percent, and they fly the aircraft to shaker, recovery call is set max power. The nonflying will call positive rate, the flying pilot will call gear up and the nonflying pilot will confirm gear up. The non flying pilot will then call V speed + 20, meaning V2 plus 20, the flying pilot will call flaps up, to be confirmed by the non flying pilot.

They should never lose altitude. But if they would lose altitude, recovery is back to the original altitude.

Unusual attitude, usually occurs in the last period; period 5 or 6 and on every recurrent check ride.

Once in the simulator, he prebriefs them on how to roll the simulator. Flight freeze is used. By doing this, they go through every regime of the EADI, and as they go through this he will flight freeze them and show them what they are seeing on the EADI and they talk about it. They do one roll and flight freeze it. Then take them off the flight freeze and do jet upset in various configurations, after seeing the information as displayed they have the chance to apply it. They know it will happen, just don't know when.

Jet upset can roll you 360 degrees if you hit the core. Typically, a student will get a 90 degree or more roll depending upon their reaction. Then they roll out of it. Generally followed by a pitch down tendency. He can given them an intensity level, but he cannot control how the students will perform. They seem to come back against the roll. Most students have an aversion to an airplane up-side-down.

Ten out of 10 pilots will right the airplane by countering the way entered into the turn, fighting against it. This is usually successful. Brasilia has powerful engines and the people who do the best are the ones who add the power.

Most of the students seem to recognize the airspeed. First tendency of students is to roll against turn. If student is gaining control of the roll second concern is power Simulator

has air noise and as air noise increases students will pull back on power. The average pilot will roll wings level and will cut power if airspeed increased, then will use elevator. These actions may occur simultaneously.

Always taught that the condition levers should be advanced slowly and continuously, don't jam them forward. Moderate continuous application. If you shove power levers too fast you are liable to over torque the engines.

Only in severe icing conditions, will ice build up in the windows or propeller hub at a rapid rate, and on airframe surfaces. The autopilot comes off, period. The holding speed is 170 knots. Nothing written. Add power if the slow speed indicator is showing slow. The fast/slow airspeed indicator is not practiced in the simulator; they teach airspeeds.

He would estimate that last year he taught about 48 students during the year in unusual attitudes, plus any recurrent checkrides

A student must be able to recover from an unusual attitude to pass recurrent, through the wind shear.

He takes them through unusual attitudes step by step, and they understand the concept. Usually in the last session. Generally, there is an interval of about 10 to 15 minutes between walking them through the unusual attitude and then an unexpected one. They are usually at the marker, at or slightly above glide slope. Weather conditions usually not real low ceilings, usually IMC. He wants them to understand what is in the EADI. A matter of seconds to recover. Both captain and first officer get unexpected unusual attitude, about 5 minutes apart between first and second events.

Usually the non flying pilot helps the flying pilot by becoming a sort of "talking flight director" giving information on pitch, roll, power, and rudder.

He has always seen students recover.

Students have pushed the power levers forward in a rapid movement. Power application is pushed evenly. Does not exacerbate the situation. Has not seen differences in power application that made the situation worse.

He has seen situations where some students don't work well together, although these are rare occurrences. Maybe 1 to 3 percent. In those situations, one student will not accept the suggestions of the other. At that point the other crewmember will stop making suggestions.

He has never seen students fighting each other on the controls.

Twilight is the external lighting and the brightest setting for the simulator concerning visual cues, but it's in IMC.

Unusual attitudes are usually accomplished between 170 and 200 knots; not near the stall speed.

The way he teaches unusual attitudes is consistent across the Brasilia training corps. There are no written procedures on unusual attitudes.

EADI arrows point to the direction the nose needs to go.

Difference in time required to transition to the EMB-120 versus upgrading, is about 4 hours. Unusual attitude training, is about 30 to 45 minutes of flight time in the simulator doing the maneuvers.

He did not know if the fast/slow indicator was calibrated.

No scenario addresses a rudder hardover in training. He is unaware of a rudder hardover ever occurring in an EMB-120. He was unaware of aerodynamic forces creating problems in the simulator, other than propeller problems.

Auto-pilots, while in the heading mode, have a tendency to turn. It will try to maintain that heading. Thus if it kicks off, it will try to go in that direction rapidly.

JANUARY 16, 1997

COMAIR HEADQUARTERS
COVINGTON, KY

JORDAN BROOKS
120 LINE CAPTAIN—CRM FACILITATOR

Present were: Barry Strauch, Evan Byrne, NTSB; Kevin McGreevy, ALPA

Graduate Purdue University in their aviation pilot program. Spent 9 ½ years in photogrammetry field, then did that for the Navy. Then got CFI, worked for 2 ½ years flight instructing and flying on demand. Joined COMAIR IN 9/89. About 7,000 hours TT and about 4,500 in type.

No formal training in education.

He conducts CRM training, runs CRM also for dispatchers and develops CRM for other departments as well. Schedules other facilitators and attends industry conferences on this subject, They also have done one on one CRM training with individual crewmembers, based on observations during training, pilots who instructors thought could use some more instructors.

Maintenance resource management still in development.

Original CRM work at COMAIR done by Dave Harris who did this at other airlines. Jordan attended CRM training at Southwest, USAir, then went to UT several times to meet with Helmreich and Willhelm several times. Also attended Northwest Airline's program.

COMAIR hosted a Regional Airlines conference on CRM about 3 or 4 years ago on this subject. He also reads up on CRM, through Web sites and other sources.

Participates in several working groups on the subject, such as those on the Web.

Initial captain course, set up by Capt. Dave Harris, who worked with DL, AS, PA, and others. He and Ken Marshall spearheaded CRM here at COMAIR. He basically modeled in on what he had done with other carriers. Also put them in contact with group at UT.

Use CMAQ, questionnaire distributed to pilots and F/As in summer 1990, to assess knowledge of CRM. Based on that UT gave a report back to Capt. Harris. They then selected 2 captains, 2 FOs, and 2 F/As who then sat down and wrote the program.
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The F/As do the teamwork, communication, conflict resolution and stress portions of the CRM program. Pilots use the entire program consisting of the following modules:

Teamwork; Communication; Assertion & Advocacy; Conflict Resolution; Crew Qualities; Critical Thinking & Decision Making; Situation Awareness; and Stress.

All pilots were brought together at some point in time, pilots for 2 days, and all flight attendants brought together for a one day program. About 3 years ago completed sending all pilots throughout the company. Since then all new hires go through the same program during their initial training at the Academy facilitated by the CRM instructors.

It is not a lecture but use experiential learning. They stress the importance that if you sit and talk to someone they will not retain much. If you show them information there is a greater likelihood that they will retain it.

Meaning of experiential is by involvement. Use video tapes and get class involved so that they are working with each other. Set them up in teams, ideally in a class of 24 would have 4 groups of 6 pilots. Some exercises are relatively abstract and some pertain specifically to the airline operations.

Idea is to not use lecturing so that students will pick up things through their involvement.

Day 2, Critical Thinking and Decision Making builds on material from Day 1, use NWA 255 accident, and use a computer generated recreation of that and show that to the class. Get class to recognize where the human factors breakdowns occurred, in conversations between pilots, checklist procedures, etc.

Situation awareness is next, use EAL 401 in Everglades and dividing up duties and stress the need to maintain knowledge of what is happening. Illustrate ATC's contribution as well. Last module, for both F/As as well is stress, actually had people on one occasion throw punches at each other, throw chairs. Talk about how to identify stress and need to identify it, at home as well as at work and deal with in constructively, and show destructive ways that don't work.

Initially, at end of the workshop, pilots complete the CMAQ and sent them to UT which tabulated results and showed how pilots attitudes have changed. With new hires, they give pilots CMAQs before and after and they tabulate results themselves. Although UT faculty pointed out that with no line experience must interpret the results of the pilots with that in mind.

Pilots, F/As, Dispatchers are taught separately. Same instructors teach all whether pilots, F/As, dispatchers, etc. Use the Advisory Circular 120A as reference guide to develop course.

Right now have 8 facilitators, 6 pilots and 2 F/As. They were chosen through an interview process. Was a job posting. No additional pay involved. They look for experience level, ability to work with committee structure, their understanding of CRM, and what they

could contribute to the Committee, to the pilots and to the F/As. To date no one with formal training in education, although they are interviewing someone with 2 masters, one in psychology. They were about to hire one who had a Masters in clinical psychology but she left to go to a major airline.

Because facilitating is so different from lecture, they ask the interviewee to bring something to the interview to "facilitate." They have annual recurrent CRM modules so that at this point people have seen enough to know that they are looking for good communication skills, can command respect from pilots. They have stayed clear of those who had management roles since they want line people to give the program credibility and can enhance the candor of the discussions. This latter part has been shown to be true having observed many of the discussions.

They used the Kuala Lampur accident 3 years ago to the pilots to stress assertion and communication requirements. Also to illustrate the accident chain.

Used the Dryden accident with the pilots, to illustrate communication and conflict and assertion. Dealt with stress and a little with fatigue.

Two years ago distributed a survey to pilots and F/As, again to see how CRM to get a picture of communications and obstacles to communication. Compiled the survey and asked class what do you think the F/As said, and asked them the other. Found that the classes did not really guess how the other would respond. They have a pilot in attendance at the F/As as class and a F/A in attendance at the pilots' class. People were talking about this on the line in terms at what F/As were expected to do in RTO and what they thought they should do.

Last year covered Captain's authority, covered their roles, and the roles and responsibilities of Captains, F/O and F/A. Covered authority with participation with captain, and assertion with respect for the F/Os and F/As. F/Os and captains' roles covered in the manual but not the flight attendants in their own manual.

They are up front that they cannot solve the problems but they can provide the means to help solve their own problems.

Jordan is off line a week a month doing CRM and the rest of the time flies, so he flies about 50 hours a month.

Had about a 40 percent response rate when questionnaire distributed (about two years ago), good considering this was done around Christmas time.

They have a 4 hour captain upgrade module which touches on teamwork communication, heavily in decision making and understanding the authority with participation of the captain.

Automation module given to RJ pilots only.

Initially UT people flew the line when they were collecting the CMAQ data, and again about 2 years ago when they were in the process of switching to AQP. This is the NASA/UT group. They gave them their findings as to what was working well and what areas needed improvement. No current activity although they are in touch with them.

No findings on informal norms used by pilots. CRM program does stress the use of checklists. Again checklist usage was covered at last year's recurrent. They try to stay away in the CRM program, what instructors cover in regular training. Last year they covered checklist because they had some minor incidents where checklist usage was thought to be a problem.

They work closer and closer with the training department and try to coordinate issues that are coming up on line with them, such as checklist usage. No regular meetings between instructors and CRM committee. CRM committee meets regularly. Jordan is kind of the mouthpiece for the CRM since he coordinates the scheduling.

He thinks that COMAIR is on par with Southwest's CRM; they even cover some of the same accidents in the same areas. The way they present the courseware is on par with them. What he has seen with NWA's program he considers on par with them. Since then NWA has hired several of their pilots including a facilitator who called back and said that COMAIR's initial CRM "blows them out of the water." Since then he has heard that from others as well.

Their point is that COMAIR's facilitators have more enthusiasm and can get people more involved. Have also had input from people from other companies who have sat in on the program and have complemented them.

He attributed much of the success to Ken Marshall's work who sold it to upper management and the support has been very good, whereas other airlines have used instructors as facilitators COMAIR has dedicated CRM facilitators.

He knew the captain of the accident flight, never flew with him but knew him through his work in the RJ. Was very well respected and a sharp guy. They relied heavily on much of the work that he did for them, on the computer.

Chief pilots' office said that they don't use CRM as a disciplinary measure, although some of the facilitators felt otherwise with some of the pilots who were sent to CRM after they screwed up and sent back for more CRM training before they went back on the line. Some of the facilitators were uncomfortable with this. This refers to the one on one training. On two occasions he dug his heels in and said that he would not do it and others on the committee would not also. Management supported him. People on the committee are quick to voice their opinion. On other occasions even if he felt strongly, others on the committee saw it from another side and they did conduct the CRM training themselves.

On two occasions first officers were sent through because it was felt that they were not assertive enough. The company felt that the captain made a bad decision and the FO should have been more assertive. He and another facilitator conducted some CRM with the two crewmembers involved. He tried to play devil's advocate with them and tried to present company viewpoint.

They were having problems, and have heard this in other airlines, with F/Os being too assertive and captains being too laid back. They are quite blunt telling captains that they must set the tone on the flight deck that they are in charge.

JANUARY 16, 1997

COMAIR HEADQUARTERS
COVINGTON, KY

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Kevin McGreevy, ALPA; Wayne Wolke, COMAIR; and William Plessinger, FAA.

2nd INTERVIEW—RALPH McWHORTER
FIRST OFFICER—EMB-120

Does not recall anything out of the ordinary regarding differences in air speed indications between captain's and first officer's indicators, on any of the 4 legs flown on the day of the accident, in the accident airplane. Does not recall either one making comment on the air speed indicators during the flights.

Does not recall any discussions regarding the fast/slow indicator either. No indication of flap problem or flaps going too slow. Aircraft did not require unusual trim. All indications were within limits. It was a nice flying airplane.

He used heading indicator in the autopilot and did not remember the autopilot exceeding standard rate turn when it was engaged.

All the equipment seemed to work fine on all the 120s that he flew. Does not recall experiencing any of the types of anomalies asked about in any of the 120s he has flown.

Wayne Wolke, COMAIR Program Manager for the EMB120 suggested that the NTSB interview John Dow, an FAA official involved in the icing tests of turboprop aircraft, following the ATR accident in Roselawn.

He found that the EMB-120, unlike other turboprop aircraft, had difficulty in icing conditions. Therefore he recommended using holding/climbing speeds of 170 knots. There was no guidance from the manufacturer. That is why Wayne put that in the bulletin that was issued in the fall.

JANUARY 16, 1997

COMAIR HEADQUARTERS
COVINGTON, KY

MATT JACOBS
EMB-120 PC/LINE CHECK AIRMAN

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Kevin McGreevy, ALPA; Wayne Wolke, COMAIR; and William Plessinger, FAA.

Has about 7,500 TT, about 5,500 hours in the 120, 2,000 as PIC and 3,500 as SIC. Had 2 years as line check airman and 1 ½ as PC check airmen.

He knew the accident captain. Not socially. He did not fly the line with him. Only saw him fly in the context of training and/or checking. Encountered him first in the aircraft after he had completed his sim work. After his simulator type ride, pilots have the opportunity to fly the airplane. They picked up the airplane in Huntington, WV, (HTS) and flew it there.

If training in the simulator was complete, and without need for extra work, the following is accomplished: pilots are given an opportunity to check the actual aircraft; do preflights, engine checks, simulation of single engine ILS (using 2 engines in an ILS approach) to a missed approach, then a simulated single engine landing. This is pretty routine. This is what the accident captain had.

His skills were standard. He answered the system questions well, although Matt did not give him the oral. He seemed to have a good understanding of the aircraft.

Rudder trim is a crew coordination maneuver, where the non flying pilot can assist the flying pilot to make rudder adjustments, and then use trim to relieve pressure. Only one such ride is required if standards are met, if more is needed, it will be given. This captain only got one such ride.

After approach briefing is complete, radios set after first vector, then tune and identify frequencies. On base leg, the flight attendant is seated and the airplane is configured with flaps. Power accordingly per ATC assigned airspeed. Expect a vector to intercept final. If autopilot engaged that is when you would select approach mode. When localizer is captured it will arm the glide slope. When one dot below glide slope, gear down, condition levers max; flaps 25, landing check. This is standard. If flight director is up you need to program that to do what you want, but normally you are in heading mode.

When captain had this flight the weather was a "nice night."

Normally on base, you will get the flaps out, dictated by ATC. They teach angle of attack indicator as a reference or guide. Also referred to as a fast/slow indicator.

Minimum approach speed is 160 knots., in a clean configuration, this is their approach speed. If reduced to a speed slower than that, he would personally not reduce to speed slower than that without configuring. The published clean minimum is 160 knots.

He did not encounter difficulties on the ride. If he does not recall it, it was a good ride. Normally airplane is flown in the pattern.

He flew flight the way they were taught to fly. He expressed no concerns about the airplane. He was looking forward to flying it again. This was considered a training event and not a check. The first approach was a coupled approach to a coupled miss, full automation.

Does not recall any contact with him since that night.

He knew the first officer as well, also professionally, not socially. Flew with him on line flights, although does not remember how many, and he gave him a PC check last year. On line flights he was the captain and Mr. Reece was the F/O. Does not remember the PC check as far as individual behaviors. Does not recall anything.

His performance was consistent with that of other first officers. Did not fly with him when he was new. He does not remember him doing anything out of standard operating procedures. You want them to know what to do and when to do it.

He never expressed concerns about the EMB-120. He really enjoyed the aircraft.

A couple of knot difference between air speed indicators is common, among captain's side, first officer's side and standby.

Never heard pilots talk about it, or about slow fast problems in the indicator, like one being different than the other. No peculiarities with autopilots.

Captain's CRM skills were above average. When he rode with him (serving as first officer to him) there was a good two way flow of communication.

First Officer's CRM skills the same, also above average, good two-way communications.

He averages about 4 to 6 of these training events a month on some months and others none at all. The captain's ride stands out because it was in Huntington, normally it's in Evansville.

These training events are done because they want to do visual pattern work in the airplane, and to show the pilots the airplane before they carry passengers. They also do practice single engine approaches in the airplane without passengers.

He does unusual attitude training in the simulator. He provides this to all pilots in recurrent check rides. They started this some time back, after the Roselawn accident. They roll the simulator to show the cues too look for in the EFIS. They can also induce a jet upset to simulate a wake turbulence encounter and have the pilot take appropriate steps to counter it. It may take the simulator all the way over. They pre-brief it, and advise them that it will occur.

The outcome, if not prebriefed, will vary in terms of recovery. There is more success with demonstrating it first, stepping them through it. This maneuver is always trained to a successful outcome.

The upset is randomly generated in the simulator, once he presses the button. He finds that when pilots respond, they tend to correct it, but if they hesitate, they can lose control.. He has seen a little of everything in pilots' response, probably more attempting to bring it back. There appears to be a comfort factor from your last know orientation.

He has not noticed pilots having problems interpreting the extreme parameters of the EFIS during an upset.

If upside down the chevrons will get bigger and will point. In extreme attitudes the chevrons are followed by an arrow. If aircraft is pitched down 90 degrees, there will still be some blue in the EFIS display. There is some brown or blue showing in any attitude, he believes.

JANUARY 16, 1997
COMAIR OFFICES, COVINGTON, KY

JOHN CRUICKSHANK
EMB 120 PIC AND SIM/LINE/AIRPLANE CHECK AIRMAN

Present were: Dave Ivey, Barry Strauch, Evan Byrne, NTSB; Kevin McGreevy, ALPA; Wayne Wolke, COMAIR; and William Plessinger, FAA.

Hired July 1990, 10,000+ TT, about 1,000 as 120 PIC and about 3,500 TT in that airplane. March 1995 became sim instructor, and became airplane instructor in Sept. 1995, and line check airman in May 1996.

He knew the accident captain, not well but as an associate. Only knew him professionally. Gave him his last sim line check in the Fall of 1996, maybe September. He does not recall anything significant about that check. That tells him that there was nothing derogatory about it, does not recall having to retrain him in anything. Therefore, he met standards throughout. He remembers the oral portion being better than average.

The check ride is done as a crew. In his case, there was a first officer who was there, but he does not recall the first officer's name. Each crewmember is graded individually, but they consider their performance as a crew.

Stall series are an initial training maneuver. It is an optional maneuver on the check ride. Does not usually give stall series on this. It's a matter of priorities and time available.

In the check ride, the autopilot is used for most maneuvers. This is also operational, as in airplane. One maneuver, single engine ILS, is required to be hand flown. He anticipated a good ride knowing that the captain was a strong pilot.

Normally flying pilot will trim the airplane when he can. The EMB-120 requires a lot of attention to rudder trim. Occasionally the non flying pilot will assist with rudder trim. This is voluntary and must be accepted by the flying pilot. If any sharing of trim would be on rudder, and not on elevator.

The recommended airspeed is 170 minimum clean before base. Once on base flaps 15. The power setting established there should be sufficient for remainder of pattern throughout the configuring. Normal power setting is 35 percent torque, established before base, then flaps 15, that is the configuration of the airplane with power and flaps as the airspeed decreases toward approach speed, which is 130 knots. Then gear down, condition levers max, and flaps 25 just before one dot below glide slope, bearing in mind that the 130 knots is the minimum speed until short final, when reach Vref.
Frequently you are asked to go faster to FAF, which means configuring later and less stabilized.

There is usually a right side air speed indicator usually slower than left side, but not a large difference, usually a couple of knots. An individual airplane could show more. Sim usually has the right side slower, but not by much, just a couple of knots.

Pilots don't use the slow/fast indicator much in normal operations.

The captain was given unusual attitudes in the check ride, this is not a required maneuver, nor is it graded. It was introduced about 2 years ago. He gives it after the check ride is complete and the crew knows that the check ride is finished and that it is completed. He will brief it before 2nd two hour session. They will video tape and then brief the 1st two hour session and it is then that the briefing on the unusual attitude will take place.

He will tell then that they are on vectors for final approach and 3 miles in trail from a larger airplane. Three levels of jet upset, and vary from light to medium to heavy upset. He will try to use them all. Light is pretty benign. Will usually do the light one for the first officer as an introduction.

Attitude of the airplane is at random. It is as random to him as it is to the students. He has never seen them create a stall in this, likely because of the airspeed they are carrying into it. They can cause a very severe roll rate that can take them inverted. Capt. Carlsen's was a successful recovery. Will typically do this at higher altitudes, 4 or 5,000 feet. Typical reaction is surprise and attempt to get to level flight as quickly as possible. He has not allowed one to crash. He will freeze the sim and then will discuss it and try again. He thinks crashing is a negative learning experience.

Pilot tendency is to counter the direction of the roll. He will have them demonstrate rolls of the sim all the way around. It is not an aerobatic maneuver, more for an awareness of the instrumentation. He shuts off the motion, puts it in straight and level flight and in IMC. Shows them what the various symbols are, generally around 10,000 feet.

He knew the FO, but could not put a face with a name. Gave him a check ride in 1995, likely his first annual check ride. He does not recall specifics but remembers that he was well above average for a first officer with that amount of time in the airplane. He thought that the first officer was pretty well qualified at that time. Does not remember flying with him in line operations.

Captain did some interesting things with outstation people. Was well liked and well regarded. Tried to help out ground crews. Would write thank you notes to ground people for their help. In several of the out stations would see several of these notes posted on the wall. His way of saying thanks to people who normally don't get much thanks.

When he came in for his sim ride he came in early and was reading a book. He said that he tries to read a book a day.

He had a good reputation and checked out in the 120 after flying other airplanes. This was just general information passed around informally.

Just was involved in training this week with pilots and conducted stall series them. In training they train 3 types of stalls and each has standards of altitude, airspeed, etc. Speeds for unusual attitude training is approach speed, 170 knots, or if configured, 150 knots. Try to correlate to an actual approach.

No unusual attitudes practices inside the marker, or close to the ground.

In the simulator, if pointed 90 degrees nose down, the EFIS system, which is remarkably reliable, will show at least some sky. You will always see at least a thin band of blue, but at that attitude, probably 90% brown. You will always see symbols that point. He believes that these are at 30, 45 and 60 degrees and are pointed toward the horizon. The color of the symbols is red. The standby gyro will usually tumble. The symbols can be disconcerting if inverted since it is opposite to what expected.

If he had the time he does not believe he would clear somebody if had not successfully recovered from the unusual attitude.

Does not know when Dan would write these notes. Last time he did flying in Evansville he ran into him and Dan told him that he was going back to the hotel to do some writing.

A 120 at 24,000 pounds, flaps zero or an abnormal condition, Vref would be 147knots, but the approach speed is 160 knots.

If icing on airframe, manufacturer says to add 5 to 10 knots to Vref. In that situation, with clean airplane the minimum speed would be 152 knots.

Flaps up landing is an abnormal situation.

STEVE SMITH
Federal Aviation Administration
Principal Operations Inspector (POI) COMAIR

Barry Strauch and Evan Byrne NTSB were not present.

He has been with the FAA 10 years and has been the POI for COMAIR 7 years. He has been at the Louisville, KY Flight Standards District Office (FSDO) for 8 years. He is rated on all three airplanes the COMAIR flies; the EMB-120, the CL-65 Regional Jet, and the Saab SF-340. His total time is about 10,000 hours with less than 50 hours in the EMB-120 total time and has gone through one recurrent training on the EMB-120.

His staffing at the FSDO consisted of himself, and an assistant POI (APOI) that had held that position for 3 years. In the last 30 days, positions were created for Aircrew Program Managers (APM) for the RJ and the EMB-120. The APOI was made the APM on the EMB-120 just recently. A new individual that had been with the FAA for 20 years had been brought into the office to become the RJ APM. He too, within the last 30 days.

He stated that he spends all of his time on COMAIR, as does the APOI. The APOI was rated on the EMB-120 and selected for the APM position, however, he was not involved in the selection process. The APM does not report to him. We do not speak, there is an internal problem.

The APMs must go through the carrier's complete training program to include HAZMAT, basic indoctrination, emergency drills, aircraft ground training, flight training device, and simulator . If currently rated, they will take a PC, otherwise, they will take a type rating ride. After completion of the type rating or PC, they will fly IOE on the jumpseat with a crew for a couple of days.

After IOE, they must go through instructor training and simulator operation training to learn how to operate the simulator. Check airman training follows and they will be required to take PC checks as any line pilot with the company.

COMAIR is transitioning to an AQP, so 6 month checks are not the norm any more.

He asked the question whether or not the APOI position would be backfilled. He has not gotten an answer.

The relationship with COMAIR is professional, cordial, and business like. Management is receptive to his suggestions. He sometimes says to the company, "don't roll over on this, talk to me." There have been no problems within the last 2 years with the company. Management is stable.

COMAIR had the last major inspection in October, 1995. It was a NASIP and only 3 or 4 class "C" findings were reported. All were corrected and were not regulatory. There have been no violations.

A Department of Defense air carrier survey was after the NASIP. He will send a copy of the results.

He looks at all the PTRS enroutes that have comments, good or bad, that come in. The captain was an RJ instructor.

COMAIR had the contract to train FAA inspectors on the EMB-120, when he went through that program as a paying member. He has audited all the various classes of EMB-120 training during the course of his surveillance.

He devotes most of his time to the RJ while the APOI spends about 40 percent of his time on the EMB-120 and 60 percent on the RJ. The APOI has done primarily IOE in the airplane. The APOI is rated in both the RJ and the EMB-120. The APOI has not expressed any concerns about the EMB-120 crew operating or training programs.

It has been several years since a violation has been written. Mostly on the maintenance side.

He has flown with several new hires. They were eager and sharp although they were low time pilots from the academy.

The operations manual is dated October 1995 and is primarily driven by the Handbook, 8400.10, and advisory circulars. A new bulletin system for the operations manual has been in place for 2-3 years. The flight standards manual has gone to a temporary revision system for the RJ. It is not in place for the EMB-120. A major revision was just completed on the EMB-120. This was based upon standardizing the checklists, and other clean items. The revision took a year and this was not an uncommon time frame for a large revision.

His contacts within the company are the Director of Operations, the Director of Training, and the PMs. The V.P. of Flight Operations has been retasked to day to day operations. On occasion, he talks with the president/COO of the company. He said if there was any problem to call him.. This was nice to have that support, but it also nice not to have to call him.

He knew the captain and gave him his type rating on the RJ. He was a performance engineer for the RJ, and an instructor check airman. He has personally flown with every check airman before they become an instructor. The captain has been in his right seat as well performing as an acting SIC during observed checks. He has also observed the captain instruct.

He had been accused of "cloning" the check airmen and he considered that a compliment. The captain's style was the same as the rest of the check airmen. They all do a good job and he has observed the captain both on the line and in the simulator.

There was nothing remarkable about the captain either as a PIC or acting SIC regarding his performance.

Much of the RJ training was in Montreal, Canada and they were together up there. They had dinner together a few times. He doesn't recall the captain wearing any type of glasses.

He has not seen the company use self disclosure on any operational issues.

The Director of Training has been great to work with. No training issues or glitches. He rented the simulator with a COMAIR instructor to demonstrate unusual attitudes. His two schools of thought were that the attitudes can't or shouldn't be done in the simulator. However, on the other hand, get all that you can get. The profile has no checking, because they have no data. He observed the wake turbulence jet upsets. The simulator has not been qualified by the National Simulator Evaluation Program for this maneuver. It is somewhat of a compromise and he is undecided about its benefit.

The relationship with the APOI does not compromise the oversight of the carrier. This problem is all internal.

APRIL 3, 1997
COMAIR OFFICES, COVINGTON, KY

WAYNE A. WOLKE, Captain
COMAIR, EMB-120 Program Manager

Present were Dave Ivey & Barry Strauch, NTSB, Kevin McGreevy, ALPA, Mark Lowell, Embraer, and Bill Plessinger, FAA.

Capt. Wolke is a captain at COMAIR, currently flying the Saab 340. He is also employed as COMAIR's Program Manager of the EMB-120 airplane.

Capt. Wolke graduated from Embry-Riddle Aeronautical University in 1980, and then was employed as a flight instructor. He instructed for 7 years until he was hired by COMAIR in 1988. He served as a first officer on the SA-227. Six months later, he upgraded to captain and was a Check Airman within 9 months of his date of hire. In 1990, he became a full time instructor in the SF-340, after serving as a full time instructor on the SA-227. In the Spring of 1990, he became a check airman on the SF-340 and then one year later became program manager on that airplane. In 1993 became program manager of the SA-227 due to the high washout rate on the airplane. One of the airplane instructors later took over that position. He will hold the position on the SF-340 until the end of April 1997 when the last SF-340 at COMAIR is to be phased out.

In April 1995 he was selected as the program manager of the EMB-120. He has about 90 hours in the aircraft in the left seat, but the FAA's principle operations inspector (POI) will not allow him to be type rated because the POI does not want him to be dual qualified in the EMB-120 and the SF-340. In May 97, Comair intends to have him become qualified on the EMB-120, and in the summer 1997 he will obtain line, simulator and proficiency check airman status.

His total time is 11,000 hours; with 90 hours in the EMB-120; 4,000 hours in the SF-340.

Since he took over as the EMB-120 program manager, the only change implemented in training has been to standardize it to make it closer to that of the SF-340 and the Canadair RJ. Procedures and courseware were "cleaned up" according to what Capt. Wolke learned from having been through several FAA NASIPs, to include what he knew the FAA was looking for. The program was looked at in terms of simulator training; briefings were standardized, and deice procedures standardized, except for aircraft specific items.

At the time Capt. Wolke took over, there were "grandiose" plans to standardize the EMB-120 manual closer to that of the RJ. At the time, the company planned the "highest" level airplane, but in reality since that time there have not been major changes to Sections 3, normal procedures, and Section 7, maneuvers and procedures [of the EMB-120 Flight Standards Manual]. They increased or decreased certain areas for emphasis based on

problems they see. There have been no real changes to the simulator training since he took over.

His job is overseer but he has two people who work for him, one oversees the instructor staff (Keith Stamper) and the one (Dan Gates) who oversees the technical side, the one who writes the procedures, is the "technical expert on the EMB-120."

Upset training, or what Capt. Wolke refers to as a "demonstration" was programmed in the simulator when he took over. It is not a testing item, it is a demonstration. They want them to recognize it, see it, and know how to respond, but they try very hard not to make it a "negative learning" experience by having the students crash.

In the lesson plan students are shown a wake upset behind a heavy jet. The airplane can be rolled to 60 or 120 degrees, it is random. In the other scenario, the instructor puts the student in an unusual attitude, upside down. When Capt. Wolke went through it, the instructor stopped in the middle and explained what was visible in the cockpit, then talked about it.

After that the student can be shown some more. When Capt. Wolke took it instructor followed with the wake turbulence upset and he told Capt. Wolke when it was coming. The purpose is to show the pilot what he sees and how to recover. No stall training is associated with this. Since the accident they have incorporated stalls in the simulator to the point that the stick pusher is activated and if the pilot does not respond appropriately, this can end up into an unusual attitude. Instructors told Capt. Wolke that some percentage results in crashing the simulator. Before this change, stall recovery was initiated at first sign of buffet in a clean configuration, flaps down, and in a turn. There have been no revisions to Section 7 of the [Flight Standards] manual as a result of the accident.

During Capt. Wolke's EMB-120 training, the fast-slow indicator was mentioned and shown to be used as an aid during a wind shear recovery. They are considering adding more lengthy training in use of slow/fast indicator. Next month they will look at both ASA and Sky West Airlines to see how they incorporate it in their training. They are considering adding more emphasis to it. It is not used as a tool in stall recognition.

There are no minimum maneuvering speeds for the EMB-120. The only one he is aware of is, as per the AFM, a minimum holding speed of 160 knots in icing conditions. COMAIR added 10 knots to that and made it 170 knots in holding, without consideration of whether icing conditions are present (P. 7-67 in the Flight Standards Manual). There are no minimum speeds associated with the terminal area, and no speeds published in the airplane flight manual.

He was trained, to use 170 knots when on the base leg position, the minimum speed to be at when at that point. They train pilots to select flaps when at the base leg position, but

the flap selection is dependent on being on the base leg, and is not speed specific. This has not changed since the accident.

There is no speed associated with flap selection during the approach, when vectoring, or when maneuvering the aircraft. There is no criteria for the selection of flaps. No changes in this, but discussions now going on with instructors, and they are waiting for information from icing meetings and so on, but they expect to have a flight standards revision, No. 10, that will be a lengthy revision to Section 7, that will make flap selection speed and not position dependent.

Pilots get a full module on winter operations that deals with normal icing and the AD applicable to the EMB-120[13]. It deals with SLD, Super Cooled Water Droplet icing, as well as 'normal icing' and also covers deicing procedures at CVG and out stations. The AD became applicable at the end of 1995, or early 1996, and an operations bulletin was issued April 12, 1996[14]. From that point, SLD was then put out as an AD and the EMB-120 satisfactorily passed the roll test when flown behind the water tanker, this was incorporated in Operations Bulletin 120-002. Before that, SLD was an unknown phenomenon.

To recognize ice buildup, pilots are taught to use visual cues such as propeller spinner, ice on windscreen, temperatures, icing reports, PIREPs, dispatch procedures, speed degradation, its a very comprehensive instruction. During the last three years COMAIR has trained ramp service agents on communications and procedures so that each will know what to do and say during deicing procedures, largely because CVG can get much icing conditions during the winter. The icing lesson addresses all icing concerns.

They received the Operations Bulletin, on April 12, 1996, based on the November tanker tests. Before the issuance of the bulletin and the subsequent changes, there were no changes discussed in operation of the boots at any operator conferences. They then and still teach pilots to activate the boots when between ¼ and ½ inch ice accumulation. Even now the bulletin is not required but is advisory. The bulletin states up front that it is not regulatory, that the existing procedures in AFM Change 42 was to be followed. On April 23, 1996, AFM Change 43[15] came out which changed the procedures to use wing and tail deicing at the first sign of icing, which was contrary to what they trained and still train. Less than two weeks before this the Operational Bulletin issued did not say anything different about operation of the boots. They did not make changes to support AFM Change 43 because they did not have data to support this. COMAIR still uses the "old" procedure, the guidance under which the SLD testing was carried out. The Operations Bulletin upon which the test was based told you to follow the AFM, but then two weeks later the AFM changes came out, which arrived in COMAIR on June 13, 1996.

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[13] See Attachment 15-17.
[14] See Attachments 49-72.
[15] See Attachments 22-24.

They asked Embraer and the FAA's, Carla Worthy in the Atlanta certification branch, the FAA's John Dow, and B.F. Goodrich, ,ASA, Continental and SkyWest, to get more information. Only ASA changed their procedures. B.F. Goodrich did not agree with it either since, theoretically, this would change the boot from a deicing system to an anti-icing system, for which it was not designed. Embraer did not consider this a problem either. They asked what test concluded that and there were told that it was the November 1995 tanker tests.

The FAA was not in receipt of the Operations Bulletin, and in fact, they did not get a copy of it until Capt. Wolke sent it to them 2 weeks ago (Operational Bulletin 120-002). They discussed this in detail for 45 minutes, with Mr. Crawford since there was conflicting information between AFM guidance, Operations Bulletin, and the AD, the 3 controlling documents.

The AD vs. Operations Bulletin: AD does not define last inflatable ribs, whereas bulletin makes many references to it. (Ridging is build up of ice aft of boots).

The Operations Bulletin talks about speed in SLD conditions; the minimum shall be 160 knots (page 24 of Bulletin), and also talks about speeds with autopilot on (170 knots climbing) off (160 knots during climbs), whereas the AFM does not make any distinction whereas the AD and the AFM don't mention it. The Operations Bulletin talks about ice building up aft of the inflatable tubes, the controlling documents do not.

Since bulletin 43 came out there have been no changes. Capt. Wolke does not recall if Carla was aware of this or not, but he believes she was not aware of the speeds, the ridging, the half bank or the disparity with the AD.

She said that they were considering issuing an AD to deal with speeds and flaps, but she was not specific on it. She thought that changing flap settings to speed selection (not related to icing) was a good idea, relative to information learned on this accident.

SLD came out in a bulletin 96-02, "Severe Icing Conditions per AD 9609-24." Pilots were always taught to be aware of ridging and early activation of boots is cautioned to avoid bridging. They had 2 known cases of EMB-120 bridging, one involving an instructor and another to the chief pilot, known to Capt. Wolke after the accident, although occurrences were before the accident. Information will be sent to John Dow of FAA.

Capt. Wolke does not know if the POI was aware of the Operations Bulletin, it was not discussed with him. POI is very concerned about changes based on revision 43 since he wants to know upon what evidence the changes were predicated, and because they have another booted aircraft (SF-340) that has different procedures. He's asking for criteria upon which changes were based.

At time of accident he believes ASA was the only airline that has changed. Since then Continental Express has changed following POIs getting together, Program Manager did

not agree with it but felt that he was being forced to do it by the POI, and as of February SkyWest has not changed.

No discussion on use of autopilot during icing conditions. It can be used during normal icing conditions, except that during SLD, or in severe conditions, autopilot must be disengaged and, with two hands on yoke, control airplane and check on trim. At same time contact ATC to exit as soon as possible. Aircraft is not certificated to operate in SLD.

COMAIR has had a heightened awareness on unusual attitudes since the accident, and they have added an addition 2 hour segment to show more information on systems and demonstrations on systems and unusual attitudes. This was enacted on Feb 1, based on monthly instructor meetings.

Len Magnor of COMAIR, in performance group of investigation, and Rick St. Onge also talked to Carla Worthy,. Capt. Wolke has had 2 or three conversations with her.

No information was retained on students who were demonstrated entered unusual attitudes. A student who does not meet the standard will have the demonstration continued until it reaches a successful outcome. This came about because of wake/roll upsets, he was told numerous instances of being rolled 60 degrees behind a heavy jet. He believes that since SF-340 has had TCAS on it longer, and they emphasize also use of TCAS on wake roll avoidance, that the Saab has had fewer wake roll upsets due to the TCAS.

Most of his time is spent in the office, communicating with instructors and pilots About 3 times a week he is at various pushes, or departure banks, talking to pilots, at least twice a week he talks to the manufacturer, and at least 2 to 3 times a week he talks to the FAA. He also flies at least 2 trips a month and gives a few check rides a month in the Saab, (maybe 2 every three months.) He also observes instructor training, reviews curricula, watches simulator training in the EMB-120 and is in constant, i.e., daily communication with instructors, and every other day interacts with the technical, flight standards people. The remainder of his is time spent with Rick St. Onge, Bob Harler (Mg. Of Training) and Ken Marshall, VP of flight operations.

Pilot training manual is the guide that students are to follow with the instructor to put their notes together with those that the instructor uses. He did this with the Saab in 1990 and started it with the EMB-120 in 96. Before that it was called the EMB-120 study guide. He does not know the exact date of the implementation of the new or old study guide. They are the same except for the difference in their names. Richard Sykes was the developer of the guide or study manual. This is a guide for training but could also be used on the line, although it is difficult to be implemented with ATC restrictions. Technically the parameters are mandatory. One must have a baseline to go with for each maneuver in a training situation. These are procedures.

The Flight Standards Manual on the ILS is a procedure, not a technique. He believes that the simulator replicates the aircraft, but cannot comment on whether there is data available to determine how well it performs during unusual attitudes. The motion is turned off for unusual attitudes, and it used as an FTE level 7 device for 1st 3 lessons and next 4 lessons it is used as a full motion simulator. Cannot comment on differences among instructors in teaching, critiquing unusual attitudes. He was taught to keep the ball centered, and with power applied will take much right rudder because of lack of powered rudder. As power is applied and reduced, constant use of rudder, as reduced left rudder must be put in.

His training on the Fast/slow indicator was as a supporting instrument during wind shear recovery. That was the only time it was mentioned, and he is not aware if maintenance has a calibration instrument for it. Flight Standards Bulletins are mandatory. He pointed out the reference for that in the manual.

When he was manager of training in 1994, minor record keeping problems were found in the NASIP. At that point they did well, when he became program manager of SF-340 they did very well, and the FAA was very complimentary.

Interaction with Rick St. Onge was on a daily basis, he is now the director of training, from being the director of operations, his duties are now more training. An individual has been identified but not hired to replace him. Ken Marshall is the acting Director of Operations.

No formal procedures with POI to review technical changes. He will get copies of the changes and they will discuss them. Sterile cockpit procedures are uniform across the fleet and is covered in the company operations manual.

CAPTAIN CHUCK JORDAN

Capt. Jordan was interviewed on April 3, 1997. Present were Dave Ivey & Barry Strauch, NTSB, Kevin McGreevy, ALPA, Mark Lowell, Embraer, and Bill Plessinger, FAA.

Capt. Jordan is a line pilot on the EMB-120 for COMAIR. He is a line check airman and designated examiner on the airplane. He has accrued over 10,000 total flight hors, and has accrued about 5,000 hours in the 120, all as captai8n. He will give type rating rides and simulator checks on occasion. Before this, he was the program manager on the EMB-120 from the beginning, in 1988. However, the position was not identified until 1989 and he served in the position until May 1994. He returned to the line because there was a consolidation by COMAIR of their management to CVG and they asked all managers to relocate to CVG. Because he was based in MCO and was happy there, he did not wish to relocate. The only managers that did not relocate were the MCO chief pilots.

In his tenure as program manager there were some changes to the operation as more information was obtained. He was the first COMAIR pilot to be checked out on the EMB-120. He got his training, then traveled to Brazil to pick up the airplane. At that time, ASA, Westair and COMAIR were the only customers of the airplane. He ultimately ferried 17 of the airplanes from Brazil to COMAIR.

When he was involved in the airplane they had a close relationship with Embraer. He and the other instructors developed a good relationship with Mark Lowell of Embraer, and together they developed the checklist together and then the manual. He also consulted with colleagues at the other EMB-120 operators. COMAIR developed their own manual, again after consulting with Embraer and other EMB-120 operators.

He believes that the manual now is the same as when he was manager, but it was changed quite a bit. The original manual was based on the Bandeirante EMB-110, but today the manual is based more on the airplanes that COMAIR currently has in its fleet. The flight standards manual has been reissued three different times, once during his tenure, but that was more of a format change than a substantive one.

The procedures on ILS approaches have not changed significantly. Procedurally they have not changed, while techniques and evaluation criteria may have changed somewhat. As they company has grown in its training they have grown in their use of techniques to teach procedures so that students can learn them better, and allow the pilots to better fly the airplane. He cited one example of the use of approach flaps and items to complete when one obtains the approach clearance from ATC, but this is technique and not procedural. He would criticize this in an evaluation, as an example.

Flap selection on approach has not changed; it is based on position on the approach, airspeed and ATC. In general, when completed the approach check the last time checked is the flaps. Speed associated with this is 200 knots maximum for the use of flaps. The suggested minimum speed is 170 knots , but the manual says that when turning base set the torque to a setting and set the approach flaps, make sure the approach is armed on the

flight director, and complete the approach check. Much of the time entering the base leg, the speed is slowing from 200 knots plus, to 170 knots.

Many times on training the airplane should fly safely at 150 knots clean, but it is not a practice they advocate. When somebody gets close to Vfs, (141 knots to 147 knots), those are the minimum clean speeds. This is the speed used for missed approach or engine failure climbout speed. It is a bug that is always set in front of the pilot and can be used as a reminder of the speed to always remain above. Most pilots would tell you that is the minimum speed, clean.

He is not currently an instructor. When you begin your airplane slowdown on the downwind leg, turning to final, that is when flaps are first selected, when ATC gives you the first indication that you are being turned toward the airport and you are within the airport area. Whether a check ride or in the line operating environment, largely because of the airports COMAIR flies into, ATC wants them at 250 knots in descent, then to 210 knots and then to 170 knots. He has never seen a COMAIR pilot fly the airplane at 160 knots clean. He has given thousands of check rides, and has seen everything but his statement was in reference to line qualified pilots in line operations. He attributes this to the training that COMAIR gives where the training is approach flaps prior to turning on approach, which has the result of keeping you at a safe speed properly configured.

He knew Capt. Carlson, and gave him his initial first officer check in the EMB-120. Then he became an SA-227 captain, then an RJ instructor. He knew him for a long time, but only gave him that one check ride. He also gave the accident first officer his initial check ride in the EMB-120. No problems with either one. He remembered advising the first officer that after completing line operations for a while he would recommend him to be an instructor, he thought that highly of his proficiency and his demeanor.

When they first had the EMB-!20 it was only flown in MCO, then after a few years they brought them up to CVG because it was fast. He called every operator they could find to get information on problems with the EMB-120 in winter operations, including Canadian operators. The pilots that were to fly it were all very experienced and qualified. Nobody had anything to say that was bad about its performance in winter operations. All said there were not problems. They took all of the information they could find, from SA-227 and SF-340 and added it to existing cold weather procedures guide to see what type of feedback they would get from CVG pilots and they did not say much. A year later they added their pilots' notes and had winter procedures revised. They developed many procedures in the manual but these were based on other operators and their own experiences.

Over the last few years much information on cold weather operations and contamination checks and what to look for were distributed to pilots. Capt. Wolke has taken this and put it in the manual, and taught it in recurrent. In flight one looks at the temperature and windshield wiper. Also hazardous weather is taught the same way. Also one looks for subtle indications, such as vibrating propellers, deteriorating airspeed, etc.

He never had an operations bulletin in his hand, but he was given the information , along with the pilots. He was not formally aware of the AD on SLD that says to turn on the boots continuously.

He initiated upset training at COMAIR. They did some experimenting in the simulator with a highly experienced first officer in unusual attitudes and the first officer crashed. He was aghast. In the Air Force one always got training in that. He then got together with his instructors, this was in 1993 or 94, and they developed the program and implemented it. They prebrief what to expect and how to recover now and the success rate is 100%. He is confident that if an individual was upside down he or she would know to roll out of rather than pull out of it. A high percentage want to roll and stop the turn, rather than continuing the turn and roll out of it. It requires more mental effort to continue rather than stop the turn. He believes pilots with acrobatic training are better able to continue the turn. Upset training is done during initial training and could be done on recurrent after completing all of required items.

A few reports form pilots on the controllability of the EMB-120 in icing conditions were received when he was the program manager, but he does not remember.

When he says to use the flaps on base leg, he is using a generic term for beginning the approach.

There is not much emphasis on using the slow/fast indicator in training, it is used as a guide. The indicator would be used by some instructors in stall recognition and recovery, as in wind shear recovery, but would not be used for procedures. Unusual attitude is done during recurrent training when time is available, but the difficulty is in finding an entry or initiator that is realistic.

Four or five years ago pilots were hired who are more experienced than they are today. He believes that ATC was trying to jam the accident pilots in and then slow them down, but they never got to the point on the checklist that called for flaps, they had a very gradual slowing, with turns, and in each case that took their mindset away from completing the checklist. The gradual slowing gets one lulled into not recognizing the need for flaps and not realizing that the airplane is as slow as it is. It is very unusual to be slowed that far out, but not that unusual at places as busy as DTW.

Submitted by:

[redacted]

David J. Ivey
Senior Air Safety Investigator, AS-30
April 25, 1997

AS-30
4-29-97

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