



Commuter Captain Fails to Follow Emergency Procedures After Suspected Engine Failure, Loses Control of the Aircraft During Instrument Approach

The airline failed to obtain the captain's training records from his previous employer, where he had received negative evaluations. The records were also inadequate for assessing flight proficiency, the official investigation found.

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FSF Editorial Staff

The crew of the British Aerospace (BAe) Jetstream 3201 intercepted the localizer for the instrument landing system (ILS) approach to Runway 5L at the Raleigh-Durham International Airport (RDU), North Carolina, U.S. After crossing slightly to the right of the final approach fix, the captain of American Eagle Flight 3379 noticed that the engine ignition light had illuminated.

The captain concluded that the left engine had flamed out, but he did not follow the emergency procedures for an engine failure. After electing to execute a missed approach, the captain called for maximum power on the right engine, and the airplane turned to the left. The left engine was at flight idle. The airspeed deteriorated and the stall warning horns sounded. The first officer told the captain to lower the nose, and, moments later, the descent rate increased dramatically.

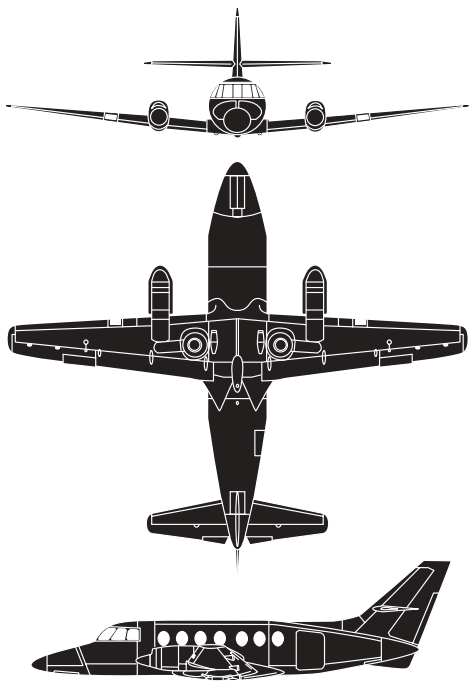
The captain failed to maintain control, and the aircraft crashed about four nautical miles (7.4 kilometers) southwest of the Runway 5L threshold. The accident occurred at night in instrument meteorological conditions. Thirteen passengers and the two flight crew members were killed. Five other passengers survived the Dec. 13, 1994, accident, but two of them succumbed to injuries soon after arrival in a hospital. The aircraft was destroyed by impact and fire.

The U.S. National Transportation Safety Board (NTSB) concluded in its final accident report that the probable causes were: "1) the captain's improper assumption that an engine had failed, and 2) the captain's subsequent failure to follow approved procedures for engine failure, single-engine approach and go-around, and stall recovery."

The report also said: "Contributing to the cause of the accident was the failure of AMR/Flagship management to identify, document, monitor and remedy deficiencies in pilot performance and training." [AMR is the parent company of American Airlines and American Eagle; Flagship Airlines is one of four regional airlines operated by American Eagle. The Flagship Airlines Jetstream 3201 was doing business as an American Eagle flight.]

The Jetstream was operated under U.S. Federal Aviation Regulations (FARs) Part 135. The accident occurred on the second leg of a three-leg trip for the crew, during a scheduled passenger flight from Greensboro, North Carolina (GSO) to RDU, the report said.

The accident crew checked in at the company operations office at RDU about 1300 hours eastern standard time, the report said. This was the first day of a two-day trip sequence for the



BAe Jetstream 3201

The British Aerospace (BAe) Jetstream 3201 (Jetstream Super 31) is an updated version of the Jetstream 31, which first flew in 1980. The J-3201 is equipped with more powerful TPE 331-12UAR turboprop engines and has a ceiling of 25,000 feet (7,620 meters). The aircraft was designed to carry up to 19 passengers and operate (with 18 passengers, flight attendant and galley) up to 600 nautical miles (1,111 kilometers; 690 statute miles) without refueling, with baggage and full instrument flight rules (IFR) fuel reserves. It has a maximum cruising speed at 15,000 feet (4,570 meters) of 264 knots (489 kilometers per hour; 304 miles per hour) and a maximum takeoff weight of 16,204 pounds (7,350 kilograms).

Source: *Jane's All the World's Aircraft*

crew, who had never flown together before. At 1441, the crew departed RDU and flew their first leg to GSO, where they arrived at 1449, the report said.

After the passengers deplaned at GSO, the crew taxied the aircraft to a fixed-base operator (FBO), so other flights would have access to the gate. "The crew entered the FBO facility at 1530, and remained in the 'break room,'" the report said. A company customer service agent discussed fuel requirements for the next leg of the flight with the captain. Additional fuel was then loaded onto the aircraft, the report said.

The crew departed the FBO and taxied the aircraft, arriving back at the gate area at 1715, the report said. Eighteen passengers boarded the aircraft. The gate agent gave the captain the load manifest for the flight, and the captain indicated that there was a weight distribution problem. Baggage was then rearranged, the report said.

The gate agent, "who had previously met both pilots, reported they were in good moods," the report said. "She described the captain as typically quiet, and the first officer as outgoing."

Flight 3379 (the accident flight) departed GSO at 1803, and was assigned a cruising altitude of 9,000 feet (2,745 meters), the report said. The captain was the pilot flying. At 1814, the crew contacted RDU approach control, and was told to expect Runway 5L. "Following some discussion about the arrival clearance, the controller stated, 'Eagle Flight 379 reduce speed to uh one eight zero [knots], then descend to 6,000 [feet (1,830 meters)],'" the report said.

The crew received vectors to the ILS Runway 5L, and were told to reduce speed to 170 knots, and to descend and maintain 3,000 feet (915 meters). "At 1828, the controller cautioned them about wake turbulence from a [Boeing] 727 that they were following, and assigned them a heading of 190 degrees," the report said. "At 1830, the final controller advised, 'Eagle Flight 379, eight from BARRT [the final approach fix], turn left heading zero seven zero, join the localizer course at or above 2,100 [feet (640 meters)], cleared ILS [Runway] 5 left,'" the report said.

The crew contacted the RDU U.S. Federal Aviation Administration (FAA) air traffic control tower at 1832, and were told, "Cleared to land, wind zero one zero at eight, traffic three-and-a-half mile final, a 727," the report said. The crew acknowledged the clearance, which was the last known transmission from the flight. About two minutes later, "an unintelligible noise was heard on the frequency," the report said.

The accident aircraft was equipped with a flight data recorder and a cockpit voice recorder (CVR), the report said. Data from both recorders were correlated with the RDU air traffic control radar plot to reconstruct the final moments of the flight.

The report said: "There was a change in engine noise similar to an increase in engine RPM [revolutions per minute] at 1833:28.7, seconds after the captain requested 'speeds high,'" the report said. "This was followed immediately by a call for 'gear down and flaps 20.' Flight 3379 crossed slightly right of BARRT, the final approach fix, while descending through 2,100 feet, and slowing below 160 knots about this time. At 1833:33.3, the captain asked, 'Why's the ignition light on? We just had a flameout?'"

The crew then discussed the engine anomaly, "and the aircraft heading drifted to the left at approximately two-thirds of a degree per second, and eventually crossed the localizer centerline at 1833:45," the report said. "At this time, Flight 3379 was approximately 3.8 miles [6.1 kilometers] behind the preceding B-727. For the next several seconds, the airplane remained relatively level at approximately 1,800 feet [549 meters], as the airspeed decreased from 140 knots to 122 knots, when the captain decided, 'Let's go missed approach,'" the report said.



Photo: Alan Pollock, U.S. National Transportation Safety Board

The fuselage separated into three sections after it impacted trees and terrain. The second section and third section are shown here.

In less than two seconds, the captain said, “Set max power,” the aircraft’s left-turn rate increased and two momentary stall warnings occurred, the report said. Then, “the first officer called, ‘Lower the nose, lower the nose, lower the nose,’ but the airplane remained at about 1,800 feet [549 meters], and the airspeed continued to decay to approximately 119 knots as the left-turn rate increased to about five degrees per second,” the report said.

Moments later, a stall-warning horn was heard, followed by dual stall-warning horns. “At this time, the airplane was still at 1,775 feet [541 meters], and the airspeed had slowed to 111 knots,” the report said. “The first officer inquired, ‘You got it?’ and the captain responded, ‘Yeah.’ The airspeed decreased to 103 knots at 1834:12, and the first officer said, ‘Lower the nose.’ At 1834:13.2, the first officer said, ‘It’s the wrong, wrong foot, wrong engine,’” the report said.

The aircraft’s rate of descent then increased rapidly to more than 10,000 feet (3,050 meters) per minute, the rate of turn increased to about 14 degrees per second and the airspeed increased rapidly, the report said. “There were several significant normal accelerations during this period,” the report said. “The airplane finally stabilized the last few seconds before impact at an airspeed of about 170 knots, a normal acceleration of 2.5 G absolute and a heading of 290 degrees.”

The report described the impact and wreckage area: “The aircraft struck a stand of trees and broke into numerous pieces as it

continued in a slight right bank, and shallow descent through the trees, on a general heading of 270 degrees true. The first significant piece of wreckage, the right wing tip, was found about 28 feet [8.5 meters] past the initial tree strike. The fuselage separated into three main sections. The first section, from the cockpit to the wing leading edge, sustained heavy fire damage, which consumed most of the structure from the cockpit windows to the front wing spar. This fire zone, the first evidence of fire-damaged structure, was located approximately 230 feet [70 meters] past the initial tree strike area.”

The report continued: “The second fuselage section, from aft of the over-wing emergency exits to forward of the empennage, was in the main wreckage area, approximately 290 feet [88 meters] past the first tree strike. This section was not fire damaged. The third section of the fuselage, from the aft pressure bulkhead to the empennage, was in the same general area. There was light fire damage on the lower right fuselage skin, and on the lower portion of the aft pressure bulkhead. The last significant piece of wreckage, a section of inboard elevator, was found 338 feet [103 meters] from the initial tree strike.”

There was an intense ground fire in the area of the forward fuselage and wing center section, the report said. There was no evidence of preimpact fire.

In reviewing the injuries, the report said: “Both flight crew members and 13 passengers received fatal injuries from blunt

force trauma, and 11 of them sustained thermal injuries from the postcrash fire. Four of the five survivors were ejected from the aircraft during impact and break-up of the cabin, and sustained blunt force traumatic injuries. The fifth survivor crawled out of the wreckage to a safe distance from the fire. He sustained serious injuries.”

Emergency response personnel arrived on the scene approximately 20 minutes following the crash, but they were only able to drive to within about one mile of the crash site, the report said. “Seven survivors were found, treated and removed from the crash site with the aid of fire fighters and four-wheel drive vehicles,” the report said. Two of the survivors died shortly after arriving at a local hospital, the report said.

Toxicological specimens were taken from the bodies of the captain and first officer. The results indicated chlorpheniramine in the captain’s liver and in muscle fluid, the report said. “Chlorpheniramine is an antihistamine, not approved for flying, contained in many over-the-counter medicines,” the report said. “It has the potential effect of reducing alertness, slowing reaction and altering perception.”

The NTSB was not able to determine what effect, if any, the antihistamine might have had on the captain’s performance, but the NTSB expressed concern “about the use and misuse of medications, both prescribed and over-the-counter, by pilots, air traffic controllers, dispatchers and others in aviation operations who may be unaware of the potential hazards many medications present.”

Investigators examined the systems on the accident aircraft. “The ground fire damage in the cockpit area prevented the determination of meaningful data from any gauges, switches, communication/navigation radios and instruments,” the report said. “The rudder trim tab position was found at approximately 80 percent of the available nose-right input.”

The flap selector switch was severely burned, but it was examined and found to be fused in the 20-degree position, the report said. “All three landing gear were found in the fully extended position,” the report said. “The stick pusher was found in the fully extended position.”

The engines and propellers were examined. “These examinations revealed that the damage inside the engines, the witness marks on the propellers and the characteristic bending of the propeller blades indicated rotation and power, and the damage was similar in character and extent, when comparing left and right components,” the report said.

The background and qualifications of the flight crew were reviewed. The accident flight first officer, 25, held a U.S. airline transport pilot (ATP) certificate, with ratings for airplane multi-engine land and airplane single-engine land and sea. He also held a flight instructor certificate, with ratings for airplane single- and multi-engine, and instrument airplane. The first officer had 3,452 total flying hours, with 677 hours in the Jetstream 3201 (J-3201). He also held a current FAA first-class medical certificate, with no limitations. The first officer was hired by Flagship Airlines in December 1993 as a first officer on the J-3201.

The captain, 29, held a U.S. ATP certificate, with ratings for the BAe-3100, Shorts SD-3, airplane multi-engine land and commercial privileges for airplane single-engine land. He also held a ground instructor certificate, with ratings for advanced ground instructor and instrument ground instructor. The captain had 3,499 total flying hours, with 2,294 hours in turboprops, and 457 hours as pilot-in-command in the J-3201. He held a current FAA first-class medical certificate with the limitation to wear correcting lenses while exercising the privileges of his airman certificate, the report said.

Emergency response personnel arrived on the scene approximately 20 minutes following the crash, but they were only able to drive to within about one mile of the crash site, the report said.

The captain began flying in 1985, and was hired by Comair in 1990, at which time he flew as first officer on the Saab SF-340, the report said. One month after being hired by Comair, he failed his first second-in-command check. “The failed items included takeoff with simulated engine failure, ILS approach-normal, ILS approach-manual, no-flap approach, crosswind landing, landing from an ILS, no-flap landing and judgment,” the report said.

After additional training, he retested successfully, and was assigned to line flying, the report said. Five days after being retested, he began his initial operating

experience (IOE) with a company check airman. The report listed the following comments by the check captain on the IOE form during four separate flights:

[Flight 1] — “Still needs some work on his landings and operational procedures. Not ready for SIC [second-in-command];

[Flight 2] — “All nonflying pilot duties OK ... still having some problems judging approach and landing procedures. Final approach is weak and landing [flare] needs a lot of work ... recommend several more landings with check airman before sign-off;

[Flight 3] — “Concentrated on landings and approaches. Still a little weak on visual approaches; [and,]

[Flight 4] — “Meets minimum qualifications for SIC.”



Photo: Alan Pollock, U.S. National Transportation Safety Board

Wreckage is strewn in front of the remains of the aft fuselage.

When reviewing Comair's records, investigators found three evaluations of the accident captain during his probationary year as first officer on the SF-340. "The first [evaluation], based on a month of flying [with a line captain], indicated that the line captain had some concern about [the first officer's] flying skills," the report said. "[The line captain] noted that [the first officer] 'most always' on instrument approaches made some abrupt inputs that produced departures from altitude or heading. He also noted that 'he becomes distracted because he gets upset with his performance.' The captain's recommendation was that he remain first officer for at least a year," the report said.

Two months later, a second captain evaluated the first officer as above average in overall job performance. "However, he [the evaluating captain] responded 'no' to the question of whether he would feel comfortable as a passenger if the first officer was the captain," the report said.

About six months later, a third line captain, who flew with the first officer for two days, "described him as average in job knowledge, equipment knowledge and job performance," the report said. "He [the line captain] commented that [the first officer] would think twice before asking for something, and that he was moody and unpredictable."

When interviewed during the investigation, the third line captain said that he had recommended that the accident captain be dismissed from the company. "According to the Comair vice president of operations, the accident captain was

allowed to resign from Comair in lieu of termination," the report said.

Investigators also interviewed the first line captain who evaluated the accident captain at Comair. The line captain commented that the accident captain "had below average piloting skills that required my constant attention, especially in the terminal area," the report said. "The evaluation reflects that [the accident captain] was a concern to me because of his timeliness in performing tasks. [The accident captain] was frequently 'behind the airplane' and often lost situational awareness. While [the accident captain] and I never experienced any emergencies together, I was somewhat concerned that [he] may freeze up or get tunnel vision in an emergency situation," the report said.

The accident captain had applied for employment with Flagship Airlines in October 1990, while he was still employed with Comair, the report said. On the employment application, the captain signed a civil release to allow AMR Eagle to ask Comair to grade his job performance, among other items, and to indicate whether they would re-employ him.

When investigators reviewed AMR Eagle's records, they found "the word 'HOLD' written on the captain's application forms, and they had no record that the inquiry form was ever sent to Comair," the report said. "However, Comair officials indicated that even with a civil release, company policy limits release of airman/employee information to dates of employment and aircraft operated," the report said.

Later that month, “the captain completed a one-day interview process that included medical, general and professional interviews, and a simulator evaluation,” the report said. Flagship Airlines offered him employment in December 1990, and the captain accepted. He then resigned from Comair in early January 1991, and was hired by Flagship Airlines four days later, the report said.

After being hired by Flagship Airlines, the accident captain was assigned to J-3201 first officer training, which he completed in March 1991, the report said. “He served as first officer until January 1992, when he was eligible for captain upgrade training in the Shorts SD3-60,” the report said. During upgrade training, “the instructor indicated that [the accident captain] had unsatisfactory progress on single-engine, nonprecision approaches,” the report said.

Two days before his upgrade check ride, the accident captain “was graded unsatisfactory on crosswind takeoffs and landings, engine failures and single-engine missed approaches,” the report said. He was given additional training, and successfully passed the initial type-rating proficiency check in May 1992. During that month, the accident captain completed his IOE, and received a line check from an FAA inspector. He was then assigned to line operation, the report said.

In September 1992, the accident captain began captain upgrade training in the J-3201, the report said. In October, he failed the type-rating check. After additional training, he passed a recheck. He then completed his IOE and received a line check from the FAA later that month, the report said.

In May 1993, “the captain was displaced from captain to first officer on the J-3201, because of a reduction in the number of slots in the domicile,” the report said. “He requalified as captain on the J-3201 on Jan. 26, 1994, and was serving in that capacity continuously until the accident. He received recurrent crew resource management training on Oct. 24, 1994,” the report said.

The AMR Eagle RDU base manager told investigators that, about one month before the accident, “he [the base manager] became aware of a first officer who was reluctant to fly with the [accident] captain, ‘because of things she [the first officer] had heard,’” the report said. “After discussions with the base manager, the first officer agreed to fly with the captain, and to provide feedback on his performance as pilot-in-command. The first officer later advised that everything had gone well,” the report said.

The first officer told investigators that “she attributed her apprehension to the fact that she was operating on ‘emotion

and rumor control,’” the report said. “She did not divulge the specifics of the rumors, but she added that the captain had asked her about rumors concerning him, and that she had advised him to ignore them. She considered the captain’s flying skills average and his decision-making, command ability and leadership skills below average,” the report said.

Two days after the accident captain had flown with the first officer, “the captain called the base manager at home and expressed concern about his reputation at the airline,” the report said. “They discussed the subject again at the office, and the captain explained that he’d had a bad day, and that the experiences on that day may have prompted rumors about his ability. The captain also felt that he was not flying as much as others because he was on reserve,” the report said.

The report continued: “The base manager offered to assist him [to] secure training time in the simulator, but the captain declined the offer. Several days after these discussions, the base manager was advised by another captain that several first officers said that the accident captain ‘had flying deficiencies.’”

Two days before his upgrade check ride, the accident captain “was graded unsatisfactory on crosswind takeoffs and landings, engine failures and single-engine missed approaches,” the report said.

The base manager said he told this captain about “the events of the past few days regarding the first officer who balked, then flew, with [the accident captain] and subsequently reported everything normal,” the report said. “I advised him to tell any first officers who flew with [the accident captain] and felt there were reasons to doubt his performance to come forward to me. Since that time, no one came forward, and I don’t recall hearing of any other instances relating to [the accident captain].”

The captain had been on sick leave for three days before the accident flight, the report said. His two roommates said that the captain had behaved normally, and they could not explain why he had called in sick.

One of the captain’s roommates told investigators that, the night before the accident, the captain discussed the impending base closure at RDU, the report said. “The captain indicated that he did not want to be transferred, and was considering resigning from the airline,” the report said. “He told the roommate that the next day’s trip might be his last. The captain and his roommate prayed about the situation, and he went to bed between 0045 and 0130 on ... the day of the accident.”

The captain got up between 0815 and 0830 and went to a college campus where he was taking classes. He returned home between 1030 and 1045, and he went to the airport between 1130 and 1200, the report said. The first officer had flown 14 trips for AMR Eagle in the three days prior to the accident flight, the report said. He had been living in a company-provided hotel.

CVR Transcript of Final Moments of Flight 3379

1833:33.3 CAPT: Why's that ignition light on? We just had a flame-out?

1833:38.4 FO: I'm not sure what's goin' on with it.

1833:39.8 CAPT: We had a flame-out.

1833:40.7 CAM: [Low-frequency beat sound similar to propellers rotating out of synchronization starts and continues for approximately eight seconds.]

1833:41.4 FO: 'K, you got it?

1833:42.5 CAPT: Yeah.

1833:42.8 FO: We lose an engine?

1833:43.6 CAPT: OK, yeah.

1833:45.2 CAPT: OK, uh ...

1833:46.0 FO: I'm gonna turn that ...

1833:46.5 CAPT: See if that, turn on the auto ...

1833:48.2 FO: I'm goin' to turn on, both uh ... ignitions, OK?

1833:51.5 CAPT: OK.

1833:54.2 FO: We lose that en' left one?

1833:55.9 CAPT: Yeah.

1833:58.9 FO: Watta you want me to do, you gonna continue?

1834:00.1 CAPT: OK, yeah. I'm gonna continue. Just back me up.

1834:03.1 FO: All right, I'm gonna ...

1834:03.7 CAM: [Low-frequency beat sound similar to propellers rotating out of synchronization starts and continues for approximately three seconds.]

1834:03.9 CAPT: * let's go missed approach.

1834:05.0 FO: All right. **.

1834:05.3 CAM: [Sound similar to single stall warning horn starts and continues for 0.7 seconds.]

1834:05.7 CAPT: Set max power.

1834:06.1 CAM: [Sound similar to single stall warning horn starts and continues for 0.3 seconds.]

1834:06.5 FO: Lower the nose, lower the nose, lower the nose.

1834:09.4 CAM: [Sound similar to single stall warning starts.]

1834:09.6 CAM: [Sound similar to dual stall warning horns starts.]

1834:09.8 FO: You got it?

1834:10.8 CAPT: Yeah.

1834:12.2 FO: Lower the nose.

1834:13.0 CAM: [Unidentified rattling sound]

1834:13.2 FO: It's the wrong, wrong foot, wrong engine *.

1834:14.7 CAM: [Sound similar to dual stall warning horns stops.]

1834:14.8 CAM: [Low-frequency beat sound similar to propellers rotating out of synchronization starts and continues for approximately four seconds.]

1834:14.9 CAM: [Sound similar to single stall warning stops.]

1834:16.1 CAM: [Sound similar to dual stall warning horns starts.]

1834:16.3 HOT-B: [Sound of heavy breathing]

1834:17.6 CAM: [Sound similar to dual stall warning horns stops and single horn continues.]

1834:18.2 CAM: [Sound similar to dual stall warning horns starts.]

1834:18.9 FO: Here.

1834:19.6 CAM: [Sound similar to dual stall warning stops.]

1834:22.3 CAM: [Sound similar to dual stall warning horns start and continues to impact.]

1834:24.4 CAM: [Sound of impact.]

CAPT = Captain

FO = First officer

CAM = Cockpit area microphone

* = Unintelligible word

HOT-B = Sounds heard through both pilots' hot microphone systems

Source: U.S. National Transportation Safety Board

Investigators reviewed physiological factors that could have affected the captain during the accident flight. "Although the captain had taken sick leave for the three days prior to the accident, information from his roommates indicated that he was in good health the day before and the day of the accident," the report said. "Similarly, those who saw him during his duties described him as appearing normal. Also, there were no statements or sounds on the CVR suggesting that the captain was sick."

During the investigation, flight tests were conducted in a J-3201 at the Jetstream Aircraft Ltd. facilities in Prestwick, Scotland. "The tests examined the 1) engine dynamic responses that would produce an ignition light; 2) the power settings, configurations and flight controls required to produce the accident flight profile; 3) the single-engine go-around capabilities using abnormal procedures; and 4) the effects of side-slip on stall warning speed," the report said.

The flight tests revealed that "flight idle torque was needed on both engines of the test aircraft to match the accident flight profile up to the time that propeller RPMs were increased from 97 percent to 100 percent (about one minute before impact),"

the report said. During the accident flight, the captain said, “Why’s that ignition light on? We just had a flame-out?” This occurred just after propeller speed-up, the report said.

The report explained: “If engine torques are abnormally low, then increasing propeller RPM can cause engine torque to momentarily fall below [zero] percent, which causes the negative torque sensing (NTS) to activate. ... The engine ignition system has an auto-relight feature that activates the engine igniters following a negative torque condition. If the engine was operating normally prior to a transient negative torque, then its performance is basically unchanged by activating the ignition system.”

During the flight tests, the left ignition light occasionally illuminated during flight idle descents, following a quick movement of the propeller speed levers from 97 percent to 100 percent, the report said.

The report concluded that, during the accident flight, “the propellers on both engines maintained approximately 100 percent RPM from about one minute before impact until impact, which indicates that neither engine flamed out during the accident sequence.”

The flight test simulations attempted a go-around using the configuration of the accident aircraft: maximum power on the right engine, flight idle on the left engine, flaps at 20 degrees and the landing gear down. “In the abnormal go-around configuration at the weight, altitude and temperature conditions tested, the airplane could maintain 120 KIAS [knots indicated airspeed], barely hold altitude and maintain heading, but it was not possible to climb,” the report said.

The report added: “When airspeed slowed to 110 KIAS, full right rudder was required to maintain constant heading. Further decrease in airspeed to stick-shaker activation (approximately 101 KIAS) produced a left turn rate, but the airplane was still controllable. (It was also noted that pilot workload during a single-engine go-around was not excessive, using correct procedures, but that the workload was substantially increased when the abnormal go-around procedure was used.)”

Flight test simulations were conducted using the approved aircraft configuration (engine-out propeller feathered, flaps 10 degrees and gear up), and satisfactory single-engine go-around performance was demonstrated, the report said.

The report said that the captain “initially used proper crew resource management techniques in calling for the descent and approach checklists, discussing icing conditions, using positive skills for transfer of control of the aircraft and briefing the approach procedures.”

The captain detected the IGN (ignition) light “after stating ‘speeds high,’ and then requesting the first officer to configure the aircraft with 20 degrees [of] flaps and gear down,” the report said.

Then, the captain asked, “Why’s that ignition light on? We just had a flameout?” Five seconds later, the first officer responded, “I’m not sure what’s goin’ on with it.” The captain announced five seconds later, “We had a flame-out,” the report said.

This was followed by 10 seconds of silent evaluation, during which the captain decided that the left engine had flamed out, the report said. “There was no discussion about the specific parameters that led him to the conclusion, so that the first officer could concur,” the report said. “Significantly, having reached the decision that an engine had failed, there was no attempt to feather the propeller and secure the engine. The first officer did not call this fact to the captain’s attention.”

During the next 20 seconds, “... the first officer queried the captain about his conclusions, and the captain confirmed his conclusion,” the report said. The first officer finally asked, “Watta you want me to do, you gonna continue?” The captain responded, “OK, yeah. I’m gonna continue. Just back me up,” the report said.

“The captain failed to cope with what was actually a minor transient anomaly.”

The report commented: “In this circumstance, it is not clear if the first officer was really thinking of the engine-out procedures they should have been following, or merely seeking assurance that the captain had a specific plan of action. If he was concerned about the failure to follow engine-out procedures, he should have prompted the captain to implement them. If he was

skeptical of the captain’s conclusion, he should have either challenged him by identifying specific engine indications that the engine was still operating, or suggested additional tests to confirm that the engine had failed.”

About four seconds later, the captain reversed his decision, and elected to execute a missed approach. “This represents another decision that is puzzling,” the report said. “The aircraft was positioned for the approach, and all that was required was minimal differential power to continue the approach.”

The aircraft was never properly configured for a single-engine go-around, the report said. The left engine remained at flight idle, the landing gear was down and the flaps remained at 20 degrees.

The report also said that the captain “responded inappropriately to indications of an apparent engine anomaly, failed to follow company procedures for engine failure, go-around and stall recovery, and was about to lose control of the aircraft. ... The captain failed to cope with what was actually a minor transient anomaly.”

As the flight progressed, the captain continued flying the airplane while analyzing the problem. When he decided that the left engine had failed, he “neither ordered nor performed the immediate action items associated with the engine failure checklist,” the report said.

The captain did not follow the correct procedures when he decided to execute a go-around. “The increasing left turn indicates that he failed to advance both power levers, did not command flaps 10 degrees or gear up and did not maintain adequate airspeed,” the report said. “If he had advanced both power levers, both engines would have responded, and the perceived emergency would have been resolved.”

The report concluded that “the captain’s improper conclusion that the left engine had failed, and his failure to follow established procedures, led directly to the accident.”

In reviewing the first officer’s actions, the report noted that although he “asked the captain twice if they had lost an engine, he did not challenge the captain’s erroneous conclusion with specific information (RPM, EGT [exhaust-gas temperature], oil pressure, etc.) that indicated it was still operating. More importantly, he should have suggested that the captain advance the left power lever to see if the engine was operative.”

The report found that the first officer continued “a supportive role by prompting the captain to lower the nose as they encountered the stall warnings during the early stages of the go-around. Finally, the evidence suggests that [the first officer] resorted to direct control inputs and power lever movement when he said, ‘... wrong foot ...’ and ‘Here.’ Unfortunately, these actions occurred too late for recovery.”

The report concluded that “the first officer’s actions did not directly lead to the accident, but his delayed assertiveness precluded an opportunity to avoid it.”

The NTSB reviewed the ground and flight training for the J-3201 at the AMR Eagle flight training center. “Examination of the syllabus indicated that both ground school and simulator training addressed the auto-relight system and the IGN light, the engine torque/NTS system, engine failure recognition, go-around procedures and stall recognition/recovery,” the report said.

Investigators interviewed ground and flight instructors about these subjects, and received proper responses, the report said. Nevertheless, when investigators interviewed several line pilots about engine-failure recognition, they received varying responses.

The report noted: “The confusion represented in the line pilots’ answers reflected unfavorably on the training effectiveness, and, at least in part, prompted Jetstream customer support to issue the Notice to Operators that emphasized RPM as the

single unequivocal indication of engine failure. It stated that low torque and low EGT are not necessarily indications of flame-out or failure. If RPM is above 90 percent, then the engine is running. The availability of power should be assessed by advancing the power lever and checking whether the torque responds normally.”

During the accident flight, “the captain apparently did not advance the power lever to test the operating condition of the left engine, and this was possibly reinforced by inappropriate simulator training on the combined NTS/engine failure,” the report said. “This simulator demonstration allowed the RPM to remain at about 60 percent on the failed engine.”

The report said that the training “established the misconception that any NTS condition, and the associated IGN light, were connected with an engine failure. The actions of the [accident] captain and the answers of the line pilots interviewed indicated they associated the illumination of the IGN light with an NTS/flame-out condition.”

The NTSB concluded this was a “‘negative training’ situation, because the training taught a concept that was incorrect and that could adversely affect pilot performance in a real emergency,” the report said. “Although the training scenario concludes with feathering the propeller, the captain did not follow this procedure in the accident flight.”

The NTSB also reviewed the records of pilot training and performance maintained by Flagship Airlines and AMR Eagle. Investigators found that the computer-based records “contained an annotation of the dates when specific required activities were accomplished, but there were no amplifying comments regarding performance or strengths/weaknesses for reference by subsequent instructors, check airmen or managers,” the report said.

The report noted: “Information concerning specific problems experienced, if any, [was] either not recorded, or [was] destroyed once training was completed. There was not even a record to indicate when extra training sessions were required. This not only eliminated the ability to evaluate the individual’s performance, it also prevented management from evaluating the effectiveness of the syllabus. Further opportunity to evaluate both the training and the individual pilot was lost because AMR Eagle/Flagship did not require written comments during a pilot’s IOE or probationary year.”

The NTSB believed that the training records compiled by Flagship personnel on the accident captain should have caused concern. “The records not only documented the captain’s unsatisfactory progress, they reflected the maneuvers involved ...,” the report said. “Although these records were not available at the RDU base, they could have been reviewed by [Flagship Airlines] management for the RDU base manager, or sent to RDU via company mail for his own examination,” the report said.

Investigators found no evidence that the RDU base manager reviewed the accident captain's records, even when the captain's competence was questioned. "If the base manager had reviewed the AMR Eagle computerized training records of the captain, he would not have found the annotation of the failed SD3-60 training periods ...," the report said. "Also, he would not have found any record of the failed J-3201 upgrade type-rating However, these failures were documented in records available in the Flagship training records at Nashville and might have prompted additional discussion/action by management."

The report added: "The deficiencies in the company's record keeping, and the company's failure to use the records it had for safety enhancement, are best exemplified by the fact that following the accident, the director of operations stated that he had not reviewed the crew records. Moreover, although the vice president of operations had reviewed the records, he was unaware that the captain had failed a check ride in the J-3201. In short, the lack of accessibility of and sufficient detail in the pilot records apparently prevented Flagship management from reviewing the captain's performance history, even when complaints from others and self-initiated comments from him were received."

The NTSB concluded that the "deficiency in the AMR Eagle/Flagship training records prevented Flagship management from ensuring that pilot problems were being addressed in training and from adequately monitoring substandard pilot performance trends," the report said.

Four days before the accident flight, the aircraft had passed a functional check flight (FCF), the result of the right propeller assembly having been replaced, the report said. The flight crew performing the FCF found an engine torque split of 10 percent at flight idle, with the left engine torque at 8 percent, and the right engine torque at 18 percent. "The captain pointed out to the technician on board that this could possibly cause asymmetric thrust problems for pilots during landing and reverse thrust application," the report said.

The technician then made adjustments the right propeller, completed a satisfactory ground run and returned the aircraft to line operation, the report said.

In reviewing the actions of the technician to correct the problem, the NTSB found that his adjustments "could not have remedied the 10 percent torque split," the report said. The NTSB also commented that the pilot who performed the FCF where the torque split problem was discovered "should have extended the FCF to perform the proper in-flight check of the torque, which would have resolved the perceived problem," the report said.

After the aircraft was returned to service, it flew 24 flights prior to the accident. "There were no comments on either asymmetric torque indications or directional control difficulties on landing," the report said. "Both the airplane and engine manufacturers agreed that if there was a 10 percent differential in torque, the pilots would have experienced significant thrust differential on landing."

The NTSB concluded that "the torque split condition identified on the FCF was most likely an error in indication only," the report said.

Two days before the accident flight, "an entry in the aircraft log reported that the left engine did not indicate 100 percent RPM on takeoff," the report said. The propeller governor high-RPM setting was adjusted, and a ground run was satisfactorily completed. "There were no repeat squawks on this problem," the report said.

While reviewing the wreckage of the accident aircraft, investigators found a pair of safety-wire pliers. Initials inscribed on the pliers were traced to a mechanic who had worked on the main hydraulic filter housing and on other areas of the accident aircraft approximately one month before the accident, the report said.

The accident aircraft and all other J-3201 aircraft operated by Flagship Airlines were equipped with a Collins FPA-80 flight profile advisory (FPA) system. "The FPA-80 was used in lieu of a ground-proximity warning system (GPWS), under the provisions of [FARs Part 135]," the report said. During the investigation, it was discovered that "there was no record of any exemption or waiver granted to Flagship

to allow substitution of the FPA-80, as installed, for a GPWS," the report said.

The report noted: "The AMR Eagle training was inadequate with respect to the FPA-80 system. Information required by [Part 135] was not available in the airplane flight manual, and only marginal system information was included in the ground school. ... More importantly, the system, as installed in the Flagship fleet, did not meet the requirements of [Part 135]. The FPA-80 did not have a visual means of warning the pilot of excessive closure rates with terrain or deviations from the glideslope."

The report concluded: "The [NTSB] does not believe that the absence of a GPWS or the improper installation of the FPA-80 system contributed to the cause of this accident. However, the installation of a GPWS, or an approved alternate system, is essential to safe operation in the air carrier industry today. This situation raises questions about management of Flagship Airlines, and the oversight of Flagship by the FAA. The

Investigators found no evidence that the RDU base manager reviewed the accident captain's records, even when the captain's competence was questioned.

[NTSB] is concerned that other operators of the J-3201 and similar aircraft may be operating without the protection of a GPWS or equivalent.”

Since the accident, Flagship has replaced the FPA-80 in all J-3201 aircraft with GPWS equipment, the report said.

Investigators reviewed the possibility that wake turbulence from the B-727 that preceded the accident aircraft on the approach could have contributed to the accident. It was determined that the first stall warning on the accident aircraft occurred eight seconds before the ground track of the accident aircraft crossed the track of the B-727 wake vortices, the report said. “Further, in the vertical plane, the accident airplane was at a substantially higher altitude than the wake vortices at this point,” the report said.

Investigators reviewed the weather to determine if it could have been a factor. At the time of the accident, the RDU surface weather observation was: measured variable ceiling 500 feet (152 meters), overcast, visibility two miles (3.2 kilometers), light rain, fog, temperature 38 degrees F (three degrees C), dew point 35 degrees F (two degrees C) and wind 010 degrees at eight knots, the report said. The “Remarks” section of the observation indicated “surface visibility three miles [4.8 kilometers], ceiling 300 feet [91.5 meters] variable 600 feet [183 meters],” the report said.

The U.S. National Weather Service observer who recorded the observation “described the weather as steady, consistent and stable,” the report said. There was widespread light rain in the region, and “radar indicated that the cloud tops were uniform at 12,000 feet [3,660 meters],” the report said.

There were some pilot reports of light-to-moderate rime icing, and light clear icing between 9,000 feet and 13,000 feet (2,745 meters and 3,965 meters), the report said. “The crew of a company flight, being vectored for the approach at the time of the accident, stated that they encountered a trace of icing between Richmond, Virginia, and RDU at 10,000 feet [3,050 meters],” the report said. “The ice came off in the descent above 8,000 feet [2,440 meters]. They were diverted to GSO at 9,000 feet after the accident, and did not encounter any ice,” the report said.

As a result of its investigation, the NTSB found that:

- “The airplane was certificated and maintained in accordance with existing regulations, except for the improper installation of the FPA-80 as a substitute for GPWS;
- “Air traffic control services were properly performed;
- “Weather was not a factor in the accident;
- “The captain associated the illumination of the left engine IGN light with an engine failure;

- “The left engine IGN light illuminated as a result of a momentary negative torque condition when the propeller speed levers were advanced to 100 percent and the power levers were at flight idle;
- “There was no evidence of an engine failure. The CVR sound spectrum analysis revealed that both propellers operated at approximately 100 percent RPM until impact, and examination of both engines revealed that they were operating under power at impact;
- “The captain failed to follow established procedures for engine failure identification, single-engine approach, single-engine go-around and stall recovery;
- “The flight crew failed to manage resources adequately; specifically, the captain did not designate a pilot to ensure aircraft control, did not invite discussion of the situation and did not brief his intended actions; and the first officer did not assert himself in a timely and effective manner, and did not correct the captain’s erroneous statement about engine failure;
- “Although the first officer did perform a supportive role to the captain, his delayed assertiveness precluded an opportunity to avoid the accident;
- “Flight 3370 did not encounter any wake turbulence during the approach to Runway 5L, or during the departure from controlled flight;
- “AMR Eagle training did not adequately address the recognition of engine failure at low power, the aerodynamic effects of asymmetric thrust from a ‘windmilling’ propeller and high thrust on the other engine;
- “AMR Eagle provided ‘negative simulator training’ to pilots by associating the IGN light with engine failure, and by not instructing pilots to advance both power levers during single-engine go-arounds as required by the operation manual;
- “AMR Eagle and Flagship Airlines crew training records do not provide sufficient detail for management to track performance;
- “Flagship Airlines management was deficient in its knowledge of the types of crew records available, and in the content and use of such records;
- “Flagship Airlines did not obtain any training records on the accident captain from Comair. Further, Comair’s standard response for employment history would not, had it been obtained, have included meaningful information on training and flight proficiency, despite the availability of such data;
- “The FAA did not provide adequate guidance for, or ensure proper installation of, the FPA-80 as a substitute for a GPWS on Flagship’s fleet; [and,]

- “The structure of the FAA’s oversight of AMR Eagle did not provide for adequate interaction between [principal operations inspectors] and AMR Eagle management personnel who initiated changes in flight operations by individual Eagle carriers.”

The NTSB recommended that the FAA:

- “Publish advisory material that encourages air carriers to train flight crews in the identification of and proper response to engine failures that occur in reduced-power conditions, and in other situations that are similarly less clear than the traditional engine failure at takeoff decision speed;
- “Review the organizational structure of the FAA surveillance of AMR Eagle and its carriers, with particular emphasis on the positions and responsibilities of the focal point coordinator and principal inspectors, as they relate to their respective carriers;
- “Ensure that all airplanes (other than the AMR Eagle J-3201 fleet) that currently use a Collins FPA-80 in lieu of GPWS, under the provisions of [Part] 135.153, have installations that comply with the Federal regulations;
- “Require all airlines operating under Parts 121 and 135 and independent facilities that train pilots for the airlines to maintain pertinent standardized information on the quality of pilot performance in activities that assess skills, abilities, knowledge and judgment during training, check flights, initial operating experience and line checks, and to use this information in quality assurance of individual performance and of the training program;

- “Require all airlines operating under Parts 121 and 135 and independent facilities that train pilots for the airlines to provide the FAA, for incorporation into a storage and retrieval system, pertinent standardized information on the quality of pilot performance in activities that assess skills, abilities, knowledge and judgment during training, check flights, initial operating experience and line checks;
- “Maintain a storage and retrieval system that contains pertinent standardized information on the quality of Parts 121 and 135 airline pilot performance during training in activities that assess skills, abilities, knowledge and judgment during training, check flights, initial operating experience and line checks; [and,]
- “Require all airlines operating under Parts 121 and 135 to obtain information, from the FAA’s storage and retrieval system, that contains pertinent standardized pilot training and performance information, for the purpose of evaluating applicants for pilot positions during the pilot selection and hiring process. The system should have appropriate privacy protections, should require the permission of the applicant before release of the information and should provide for sufficient access to the records by an applicant to ensure accuracy of the records.”♦

Editorial note: This article was adapted from *Uncontrolled Collision With Terrain, Flagship Airlines, Inc., dba American Eagle Flight 3379, BAe Jetstream 3201, N918AE, Morrisville, North Carolina, December 13, 1994*. Report No. NTSB/AAR-95/07, prepared by the U.S. National Transportation Safety Board (NTSB). The 110-page report includes diagrams and appendices.

ACCIDENT PREVENTION

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