

# CASE STUDY NARRATIVE

## **Back Course Night ILS Approach to Narrow or Short Runway**

# Back Course Night ILS Approach to Narrow or Short Runway

- Mission: Passenger Transport
- Phase of Flight: Approach
- Maneuver or Procedure: Back Course Night ILS Approach to Narrow or Short Runway
- Operational Scenario:
- Hilly terrain on centerline of runway up to 1 mile of threshold. No ground lights on approach path. Limited ground lights around runway. Sky partially obscured, estimated ceiling 3000 feet overcast, visibility 1.5 mile, light freezing drizzle, light snow, fog, temperature 29° F, dew point 27° F, wind 180° at 10 knots, altimeter 29.85 inches of Hg, fog obscuring 5/10ths of the sky.

# Narrative

- **On December 1, 1993, Express II flight 5719, a Jetstream BA3100, registration N334PX, was operating as a regularly scheduled flight under 14 Code of Federal Regulations (CFR), Part 135, from Minneapolis/St. Paul International Airport, St. Paul, Minnesota (MSP), to International Falls, Minnesota (INL), with an en route stop at Hibbing, Minnesota (HIB). The flight was operated by Express Airlines II, Inc., under the terms of a marketing agreement with Northwest Airlines, Inc., as Northwest Airlink. About 1950 central standard time (CST), the airplane collided with terrain while on the localizer back course approach to runway 13 at HIB. The 2 flight crew members and all 16 passengers were fatally injured in the accident. The airplane was destroyed.**

# Narrative

- The crew of flight 579 began their duty day at 1325,1 when the captain and first officer reported to the Express II operations office in MSP. The captain and first officer traveled as non-revenue passengers on a Northwest Airlink flight to INL and flew the same airplane, on a scheduled flight, back to MSP. The crew's schedule thereafter was to fly to HIB, continue on to INL, remain overnight in INL, and return to MSP as non-revenue passengers on the first flight out of INL the following day. All times are Central Standard Time (CST) based on the 24hour clock, unless otherwise indicated. \*Express Airlines II, Inc. may be referred to as Express II. Neither the captain nor the first officer were scheduled to take this trip sequence. They had flown together on October 11, and on November 22, 1993.

# Narrative

- The captain was informed that he was to fly this trip sequence on November 30, 1993, and the first officer was notified on November 27, 1993. Several witnesses reported that the captain told them he was unhappy with the trip schedule change because he would be working on December 2, a day that he was scheduled to be off. After the **accident**, an Air Line Pilots Association (ALPA) grievance work sheet that had been filled out by the captain concerning working on December 2, was found in his residence. Before departing MSP to travel to INL, the captain was involved in a disagreement with a customer service agent (CSA) concerning his authorization as a non-revenue passenger. His authorization had not come with the other trip paperwork and he had insisted that the agent stop her other duties and call dispatch to obtain his authorization. Her previous experience was that pilots called dispatch themselves; therefore, she asked him to take care of it. He indicated that this was not satisfactory to him and left the area. The captain then contacted his chief pilot and was told to allow the chief pilot to handle the situation. Several minutes later, when the flight was close to scheduled departure time, the service agent queried the captain and learned that he had not obtained the authorization.

# Narrative

- **Despite her workload, she obtained the authorization so the captain would not miss the flight and thereby cause a later flight cancellation. The captain's demeanor and actions prompted the CSA's supervisor to insist that the agent prepare a formal complain against him. According to the CSA, she and the captain were involved in an unpleasant incident about 1 month earlier when he yelled at her in the office. She said that since the captain later apologized, she did not write a report about the earlier incident. The captain reached the airplane within a few minutes of its departure from the ramp. The flight crew had already closed the passenger entrance door and had started the number two engine. The door had to be reopened and the passengers and crew waited as the captain boarded, removed and hung up his coat, and took his passenger seat. The first officer for flight 5719 was already on board the airplane.**

# Narrative

- Despite this delay, the airplane departed 2 minutes earlier than scheduled at 1424. Cabin seating constraints precluded the flightcrew from conversing with the deadheading captain and first officer while en route to INL. After arriving at INL, the flight crew departed for their residences. They reported that they last observed both the previously deadheading captain and first officer performing the exterior preflight of the airplane at the same time. The captain and first officer departed INL at 1610 to fly to MSP as flight 5718. Other company pilots who knew the captain and were flying into MSP at the same time remembered hearing his voice on the MSP approach control frequency. By company practice, this would indicate that the first officer was flying this leg and that the captain was performing the duties of the non-flying pilot, such as reading the checklists and making the radio transmissions. After arriving at MSP, the captain and first officer changed airplanes for flight 5719 to HIB.

# Narrative

- **On two occasions, ramp service agents (RSAs) approached the captain and asked him if they could board passengers onto the airplane. He told them that they could not. Another RSA, who was acquainted with the captain and first officer, boarded and was cleaning the airplane assigned as flight 5719. He stated that he overheard the captain tell the first officer that the first officer had done the exterior preflight incorrectly. The captain told the first officer that he had not checked the exterior lights. The first officer replied that he had intended to do so from the cockpit. The captain said that was not the right way; he then turned on the lights, went outside and checked their operation. The captain found that the landing lights were inoperative, and he returned to the The RSA said that the captain's tone of voice was angry, and that the first officer appeared embarrassed. The RSA indicated that he had previously thought of the captain as a nice person, and that he had never seen him act like this before.**

# Narrative

- Inside the terminal, the captain spoke with another Express II captain, a line check airman, who had last flown the airplane. This captain said that he expected him to "chew me out" for not writing up the landing lights. Instead, the captain appeared to be in good spirits. The light bulbs on the landing lights were subsequently replaced by maintenance personnel prior to the airplane departing the ramp area. The captain returned to the airplane at the same time that the RSA arrived with the passengers. According to the RSA, the captain stopped him from boarding the passengers. The RSA stated that while he and the passengers waited on the ramp, the captain stood in the passenger entrance door, and hung up his coat, and then allowed them to board.

# Narrative

- The RSA gave a copy of the load report to the first officer and made the passenger announcement. The captain followed him to the back of the airplane and closed the passenger entrance door. As the RSA walked around to the front of the airplane, the captain "yelled out the window" that the airplane was 130 pounds over the allowable takeoff gross weight. The passenger door was reopened, the first officer corrected the load report for the RSA, and a passenger voluntarily deplaned. The scheduled departure time was 1810. However, flight 5719 departed at 1852 due to the late arrival of the aircraft, the replacement of the landing light bulbs, and removal of a passenger. The flightcrew reported the flight's departure time as 1858. The 1754 weather observation for HIB was: sky partially obscured; estimated ceiling 3000 feet overcast; visibility 1 1/2 miles, light snow, fog; temperature 28° F; dew point 25° F; wind 180° at 8 knots; altimeter 29.89 inches Hg. The HIB forecast valid for the projected arrival time for flight 5719 was: ceiling 3000 feet overcast; visibility 3 miles, light freezing drizzle, occasional visibility 1 mile, light snow, fog; wind 180° at 12 knots.

# Narrative

- The weather package provided to the pilots of flight 5719 did not contain the airman's meteorological information (AIRMETs) valid for the time that the airplane would be landing. As flight 5719 approached the HIB very high frequency omnidirectional radio range (VOR), the Duluth (DLH) approach controller provided the pilots with the HIB weather and cleared the flight for the instrument landing system (ILS) approach to runway 31. The cockpit voice recorder (CVR) transcript reveals that the pilots discussed the need to land on runway 13 because there was a tail wind on the ILS approach to runway 31 and the runway was contaminated. (A British Aerospace Service Letter, dated January 13, 1988, entitled "Operation From Precipitation Covered Runways," advises that landings should not be attempted in a tailwind when the runway is covered with precipitation).

# Narrative

- The captain requested and received clearance for the localizer back course approach to runway 13. The flight crew initiated the approach procedure by joining the HIB 20 DME 6 [distance measuring equipment] arc from the HIB VOR and intercepting the localizer at 8,000 feet mean sea level (msl). The HIB weather observation at 1950 was reported as follows: sky partially obscured, estimated ceiling 3000 feet overcast, visibility 1 mile, light freezing drizzle, light snow, fog, temperature 29°F, dew point 27° F, wind 180° at 10 knots, altimeter 29.85 inches of Hg, fog obscuring 5/10ths of the sky, light freezing drizzle began 1 minute after the hour. The flight crew contacted Express II's HIB station at 1936 to report that they were in range. The station agent stated that he knew the captain but that he did not hear what he considered to be his distinctive New York accent on the radio. Therefore, he concluded that the first officer made the call and that the captain was flying the airplane.

# Narrative

- During the in-range call, the flight crew told the station agent that the airplane would need fuel after arrival. They did not request weather information or request that deicing equipment be available after landing. The airplane should have arrived within 15 minutes of the in-range call, at around 1950. Around 2010, the station agent felt that something was wrong, began to make calls, and put the Express II emergency plan into effect. The following information was obtained from the CVR transcript, which contains both the intra-cockpit and air-ground communications from the latter portion of the flight (see appendix B). At 1944:03, Duluth approach control told the flight that "I show you established on the two zero mile arc, you're cleared for the localizer back course one three approach to Hibbing. Change to advisory approved, cancel with me on one two seven point four."

# Narrative

- The last recorded transmission came from the first officer of flight 5719 when he responded by repeating the clearance. At 1944:32, the captain of flight 5719 stated to his first officer "Okay put one down there to show we're cleared for the approach and since we're established what altitude can we go down to?" The first officer responded with "Thirty-five hundred." One second later the captain said "Okay, put that in there." Nine seconds later the first officer asked "Just you just gonna stay up here as long as you can?" The captain replied "Yes." Radar data show that the airplane remained at 8,000 feet until 1947:54, when the airplane intercepted the localizer approximately 19 nautical miles (nmi) from the HIB VOR.

# Narrative

- The propeller RPM's were increased, both Hibbing localizers were identified, the flaps were set to 10, the radio frequency was changed, the gear was lowered, the flaps were lowered to 20, and the first officer asked the captain if he wanted the checklist. At 1949:13, the captain stated "Before landing...well let's wait for the time when you call final approach fix, instruments cross check, no flags, times noted." The captain responded "Okay, before landing checklist to the box." The first officer stated "Landing gear down, three green, hydraulic pressure, brakes, two thousand, tested." The captain repeated "Two thousand, tested, left." Radar data showed that the airplane descended at an average vertical speed of 2,250 feet per minute (fpm), and was 1,200 feet above the minimum altitude when it passed over the final approach fix (Kinny) at 1949:30.

# Narrative

- At 1949:44.3, while inside the final approach fix, the first officer stated "Prop sync's off, prop sync's off, speed levers high, a hundred percent, boost pumps are on, before landing checklist to the box." At 1950: 10, while at 3,000 feet msl, the first officer stated "One to go." Four seconds later, the captain responded "To what alt to twenty forty, okay." At 1950:15.5, the first officer stated "Twenty forty to ah ten point oh." About 11 seconds later, the captain stated "Did you ah click the ah airport lights, make sure the co common traffic advisory frequency is set." The airplane descended through the 2,040 foot step down altitude at 1950:30, at a point approximately 11.6 nmi from the HIB VOR. The final recorded radar data point shows the airplane descending through 1,800 feet msl at 2,500 fpm at a point approximately 11.35 nmi from the HIB VOR. At 1950:40.3, the captain asked the first officer "Click it seven times?"

# Narrative

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# Procedure: Night ILS Approach to Narrow or Short Runway

**Situational Awareness  
Judgment Deficiencies**

# Situational Awareness Deficiencies

- The first officer did not adequately monitor the approach and alert the captain of the unstabilized nature of the approach and of the descent.
- The flight crew lost altitude awareness and allowed the airplane to descend below mandatory level off points, including the minimum descent altitude for the approach, and the airplane descended into the ground short of the runway.
- The first officer was distracted from his duties of monitoring the altitude as a result of untimely and poorly planned instruction from the captain.

# Resource Management Deficiencies

- **The captain did not exercise proper crew coordination during the approach, and his actions led to distractions during critical phases of the approach.**
- **The captain's record raised questions about the adequacy of his airmanship and behavior that suggested a lack of crew coordination during flight operations, including intimidation of first officers. Company management did not address these matters adequately.**
- **The National Transportation Safety Board determines that the probable causes of this accident were the captain's actions that led to a breakdown in crew coordination and the loss of altitude awareness by the flight crew during an unstabilized approach in night instrument meteorological conditions.**
- **Contributing to the accident were: The failure of the company management to adequately address the previously identified deficiencies in airmanship and crew resource management of the captain; the failure of the company to identify and correct a widespread, unapproved practice during instrument approach procedures; and the Federal Aviation Administration's inadequate surveillance and oversight of the air carrier.**

# Enabling Learning Objective 1

## PERCIEVE

### OBSERVE THE FOLLOWING PRECURSOR CUES:

- Altitude
- Rate of descent
- Airspeed
- Runway elevation
- Distance from runway
- Instrument approach plate altitudes, rates of descent from outer marker, and navigation data
- Visual illusion of being too high on approach on approach
- Visual illusion of being too far from runway on approach

# Enabling Learning Objective 2

## INTERPRET

### THE FOLLOWING INDICATOR CUES OF AN ABNORMAL OR EMERGENCY CONDITION:

- Altitude throughout approach
- Rate of descent throughout approach
- Breakdown in crew coordination (improper procedures)
- Excessive rate of descent
- Unstabilized approach
- Late start of descent
- Incorrect checklist timing
- Improper altitude at initial and final approach fixes
- Distance from runway in relation to altitude

# Enabling Learning Objective 3

## PROBABLE CAUSE

RECOGNIZE THAT THE FOLLOWING WERE THE PROBABLE CAUSES OF ABNORMAL OR EMERGENCY CONDITIONS:

- Rate of descent throughout approach
- Excessive rate of descent
- Unstabilized approach
- Late descent
- Incorrect checklist timing
- Improper altitude at initial and final approach fixes
- Distance from runway in relation to altitude

# Procedure: Night ILS Approach to Narrow or Short Runway

**Resource Management  
Decision Deficiencies**

# Enabling Learning Objective 4

## **PRIORITIZE CORRECTIVE PROCEDURES**

### **PERFORM THE FOLLOWING RESPONSE PROCEDURES FOR THE ABNORMAL OR EMERGENCY CONDITIONS:**

- Review approach plates for field before beginning approach.
- Determine MSL elevations for all approach fixes and runway.
- Brief crewmembers on approach monitoring requirements.
- Determine rate of descent and airspeed for approach.
- Fly approach in accordance with published instrument approach procedures.
- Maintain proper, stabilized rate of descent.
- Meet altitudes for IAF, FAF, and minimum descent.
- Start descent at the correct altitude and airspeed.
- Use crewmembers properly to monitor approach and perform checklists.
- Rely on instruments, not visual cues.
- Counter visual illusion of being too high on approach (cross-check instruments)
- Counter visual illusion of being too far from runway (cross-check instruments).
- Counter visual illusion of being too far from runway and too high until near or over the runway threshold. Likely to result in rapid power reduction and a hard landing short of the runway.

# Enabling Learning Objective 5

## **APPLY CORRECTIVE ACTION STEPS**

### **APPLY THE FOLLOWING RESPONSE PROCEDURE STEPS FOR THE ABNORMAL OR EMERGENCY CONDITIONS:**

- Monitor airspeed.
- Monitor rate of descent.
- Monitor flight path.
- Monitor instrument approach.
- Proactive advisories to the pilot in command
- Use navigation aids to determine distance from runway.
- Maintain instrument scan and cross-check.

# Enabling Learning Objective 6

## **RESULTS EXPECTED**

**EXPECT THE FOLLOWING RESULTS AFTER PERFORMING THE RESPONSE PROCEDURES AND STEPS:**

- **Stabilized approach**
- **Proper approach procedures**
- **Proper rate of descent**
- **Proper approach angle**
- **Proper airspeed**
- **Proper altitudes**