Federal Express Submission
B727, N497FE Accident
Tallahassee, Florida
July 26, 2002
DCA02MA054

Factual Information

1.1 History of Flight

On July 26, 2002, at approximately 0537 EDT, Boeing 727-232, N497FE, operating as Federal Express flight 1478, crashed into trees on short final approach to Runway 9 at the Tallahassee Regional Airport (TLH), Tallahassee, Florida. The flight was operating under provisions of Title 14, Code of Federal Regulations Part 121 as a scheduled cargo flight from Memphis, Tennessee (MEM) to TLH. Night visual meteorological conditions prevailed at the time of the accident. Only the three operating crewmembers were onboard. All three of the crewmembers were seriously injured, and the aircraft was destroyed by impact and resulting fire.

1.2 Injuries to Persons

Injuries	Flight Crew	Cabin Crew	Passengers	Other	Total
Fatal	**0**	**0**	**0**	**0**	**0**
Serious	**3**	**0**	**0**	**0**	**3**
Minor	**0**	**0**	**0**	**0**	**0**
None	**0**	**0**	**0**	**0**	**0**
Total	**3**	**0**	**0**	**0**	**3**

1.3 Damage to Aircraft

Impact and a post accident fire destroyed the aircraft.

1.4 Other Damage

The aircraft contacted and damaged several trees on the approach path to runway 9 at TLH. The aircraft skidded approximately 1,100 feet after contact with the ground causing minor ground damage to the area involved. Some construction vehicles and pieces of construction equipment were damaged when the aircraft contacted them at the end of the ground skid.

1.5 Personnel Information

All three flight crewmembers were certificated and qualified in accordance with

Federal Express and Federal Aviation Administration (FAA) certification requirements. A review of FAA accident/incident and enforcement records for the flight crewmembers indicated there was no history of certificate actions.

Company records provided the following times and dates for the three flight crewmembers.

Captain William Russell Walsh

Date of birth: [redacted] 1947
Date of hire with Federal Express Corporate Aviation: April 10, 1989[1]
Date of transfer to Federal Express Flight Operations: August 6, 1992
Airline Transport Pilot Certificate (August 6, 1999)
Airplane Multiengine Land
Airplane Single Engine Land/Commercial Pilot
Limitations: B727 CIRC. APCH.-VMC ONLY
Type Ratings: B727, CE-500, /CL-600
Flight Engineer Certificate (October 19, 1992)
Turbojet Powered
Certified Flight Instructor (February 5, 1973)
Rating/Level: Airplanes
Medical: First Class (June 17, 2002)
Limitations: MUST WEAR CORRECTIVE LENSES

Flight Times[2]:
Total flying time: 13,000-14,000 hours[3]
Total Federal Express flying time: 3,893.7 hours
Total Federal Express Pilot-in-Command (PIC) B727: 860.6 hours
Total Federal Express Second-in-Command (SIC) B727: 514.5 hours
Total Federal Express Flight Engineer (F/E) B727: 1,378.3 hours
Total flying time last 24 hours: 1.2 hours
Total flying time last 7 days: 7.6 hours
Total flying time last 30 days: 39.7 hours
Total flying time last 90 days: 101.5 hours
Total flying time last 12 months 356.7 hours

[1] Federal Express Corporate Aviation (a department within Federal Express Corporation) initially hired Captain Walsh. He later was accepted as a Flight Operations crewmember. According to company records, he accumulated 300 hours as Captain flying corporate airplanes. The calculation of flight times for Federal Express does not include that flying time.

[2] Totals include the accident flight time, which was about 1.2 hours in duration.

[3] Estimated by Captain Walsh.

Initial type rating with Federal Express (B727): August 6, 1999
Completed Captain Initial Operating Experience (IOE): August 27, 1999
Last recurrent ground training: July 22, 2002
Last recurrent training Simulator: February 15, 2002
Last PIC Simulator check: August 13, 2001
Last PIC line check: February 7, 2002

The Captain, age 55, was married (29 years), with one adult child no longer living at home. His residence was in Cordova, Tennessee.

He served in the U.S. Air Force in the late 1960s, but not as a pilot. He flew recreationally during his time in the military, obtaining a private pilot certificate in 1967 and a commercial pilot certificate in 1969. He obtained multi-engine and instrument ratings in 1970, a flight instructor certificate in 1971, and an airline transport pilot (ATP) certificate in 1982.

During the 1970s and 1980s, the Captain worked as a pilot for a photo mapping company, and was employed as a corporate pilot for two different companies. As a corporate pilot, he flew the Cessna Citation 501 and Canadair Challenger. He joined Federal Express' corporate flight department in 1989.

In 1992, he accepted a position as a Federal Express B727 line flight engineer. He upgraded to First Officer on the B727 in August 1995, then upgraded to Captain in August 1999. Since 1992, he had flown approximately 2,100 hours on the B727: 1,060 hours as flight engineer, 240 as First Officer, and 900 as Captain. He served as First Officer on the DC-10 for a period in the mid 1990s, flying 700 to 800 hours on that aircraft.

Two Federal Express First Officers who flew with the Captain during the week before the accident said he was a competent pilot, who used standard procedures and callouts. One said the Captain was good at making everyone feel comfortable, and had a "standard cockpit style with good CRM skills." The Captain's proficiency check records were satisfactory.

The Captain did not recall participating in any formal training on fatigue management at Federal Express, but said the company had provided handouts on the topic. He said he had never turned down a trip because of fatigue. He stated that he did not personally know any Federal Express pilots who had turned down a trip because of fatigue, but he had heard that it did happen.

The Captain said his health was "good," with no significant changes in the previous 12 months. He did not take prescription medications. He used alcohol occasionally. He did not smoke. His most recent FAA medical certificate, dated June 17, 2002, included a limitation that he wear corrective lenses. The Captain reported that, in the 72 hours before the accident, he had not consumed alcohol or taken any medications, prescription or nonprescription, except for a couple of Excedrin pills for a headache.

With respect to changes in his personal life, the Captain reported that he and his wife took a family dog to their veterinarian's office on July 25, 2002, to have it euthanized. The couple had owned the dog for fifteen years, and its health had recently deteriorated. The Captain stated that having the dog euthanized was upsetting for both of them. However, they both felt it was appropriate, because of the dog's deteriorating health. The Captain reported no other significant changes in his personal life in the twelve months before the accident.

When he was not working, the Captain usually went to bed between 2200 and 2230 and awoke between 0700 and 0730.

A search of records at the National Driver Registry found no history of driver's license revocation or suspension.

Captain's 72-Hour History

The Captain was on Reserve duty and held RA reserve period for this month[4]. On Tuesday, July 23, 2002, about 0430, the Captain received a call from Federal Express scheduling. He was told to report to the AOC building between 0700 and 0720. From there, he was to deadhead on Northwest Flight 5951 from MEM to Shreveport Regional Airport (SHV), Louisiana, and serve as Captain on Federal Express Flight 1380, which would return to MEM later the same day. The Captain departed MEM at 0845 on the Northwest flight, arriving SHV at 1010. In Shreveport, he checked into a hotel and slept from 1100 to 1400. After 1400, he engaged in routine activities around the hotel. The Captain returned to the airport about 2030. After a one-hour standby period, he reviewed departure paperwork. Adverse weather in the area resulted in a small delay. Flight 1380 departed SHV at 2242 and arrived in MEM at 2353. After arrival at MEM on July 23, 2002, the Captain was released from duty and returned to his residence.

On July 24, 2002, the Captain stayed awake for a couple of hours after midnight, taking care of a family dog, which was in deteriorating health. After caring for the dog, he went to sleep on a downstairs couch so he could more easily let the dog outside during the night. He let the dog out three times during the night, interrupting his sleep cycle, which ended about 0730. The Captain's sleep quality was "not good" that night. During the day on July 24, 2002, the Captain engaged in routine activities. He went to bed about 2130, sleeping on the downstairs couch again to more easily let the dog out. He got up a couple of times during the night to let the dog out, interrupting his sleep cycle.

On Thursday, July 25, 2002, the Captain awoke about 0730. He described his

[4] See Jim Kirby interview in the Operations Factual Report in the Public Docket for information on reserve lines.

sleep quality as, "marginal, not really good." That morning, the Captain and his wife took the dog to a veterinarian's office on July 25, about 1000 to have it euthanized. The Captain engaged in routine activities with his wife during the afternoon. Between 1800 and 1830, the Captain checked company scheduling using his home computer, and received notification of the trip to Tallahassee. He was familiar with the route, having flown the same trip previously on July 17, 2002. He went to sleep in his normal bed about 2100, and slept for about three and a half hours.

On July 26, 2002, the Captain awoke at 0030. He described the quality of his sleep as "pretty good." The Captain got dressed and drove to the airport to report for his flight. He did not recall feeling fatigued at that time. He met First Officer in the AOC, where they reviewed departure paperwork for Flight 1478. He then proceeded to the aircraft. Departure was delayed because one pallet loaded on the aircraft at MEM exceeded maximum weight requirements. The load was adjusted, and the crew proceeded with pushback at 0324, twelve minutes behind schedule.

First Officer William Lee Frye

Date of birth: [redacted]1958
Date of hire with Federal Express: October 29, 1997
Airline Transport Pilot Certificate (October 27, 1995)
Airplane Multiengine Land
Commercial Privileges: L-188
Type Ratings: None
Flight Engineer Certificate (December 23, 1997)
Turbojet Powered
Medical: First Class (October 9, 2001)
Limitations: NO LIMITATIONS (see waiver)
Statement of Demonstrated Ability (issued August 1, 1995)
Limitations: None
Physical Defects: Defective Color Vision
Basis of Issuance: Operational Experience

Flight Times[5]:
Total flying time: 7,500 – 8,000 hours[6]
Total Federal Express flying time: 1,983.2 hours
Total Federal Express Second-in Command (SIC): 525.9 hours
Total Second-in-Command (SIC) B727: 525.9 hours

[5] Total times include the accident flight.

[6] Estimated by First Officer Frye.

Total Flight Engineer (F/E) B727: 1457.3 hours

Total flying time last 24 hours: 6.0 hours[7]
Total flying time last 7 days: 11.8 hours
Total flying time last 30 days: 37.3 hours
Total flying time last 90 days: 102.7 hours
Total flying time last 12 months 482.8 hours
Completed SIC IOE: June 21, 2001
Last recurrent ground training: July 13, 2002
Last recurrent training Simulator: December 18, 2001
Last SIC Simulator proficiency check: June 19, 2002
Last SIC Line Check October 17, 2001

The First Officer was 44, married (23 years), with two children (ages 15 and 19). He lived in Brunswick, Maine.

The First Officer learned to fly in the U.S. Navy in 1981. He later obtained a civilian commercial pilot's license with multi-engine and instrument ratings based on military competence. For the next 15 years, he served as a Navy pilot accumulating approximately 5,000 hours flight experience in Lockheed P-3 Orion aircraft, including 3,500 as pilot-in-command.

Federal Express hired the First Officer as a B727 flight engineer in 1997. He upgraded to First Officer in July 2001. He had about 2,500 hours total flight experience on the B727, including about 1,000 hours as First Officer. Two Captains who flew with the First Officer in the days before the accident said he was personable and professional, with solid flying skills. Neither recalled any deficiencies in his performance as a flight crewmember. The First Officer's proficiency check records were satisfactory.

The First Officer recalled taking Federal Express' computer managed instruction section on physiology, which included guidance on fatigue issues. This instruction was part of recurrent training he received in June 2002. He had never turned down a duty assignment for fatigue, and he did not know anyone who had. He said he thought that turning down a duty assignment for fatigue was unofficially discouraged, and that there might be repercussions for calling in fatigued.

[7] Flight time includes only 2.1 hours of the 2.8 hours conducted as flight 134. The flight departed before the 24-hour period prior to the accident. The flight time used in the calculation was from 0537 until the flight arrived at 0745 on July 25, 2002. See NTSB Human Performance Factual Report for more details.

The First Officer characterized his health as "good," with no significant changes in the previous 12 months. According to his medical certificate, First Officer Frye was operating under a waiver of demonstrated ability for defective color vision. In his interview, he stated that this was a recognition problem in the blue-green range detected when he applied for his first civilian rating. No color vision defect was identified during his Navy career. His medical had no other restrictions. He was not taking any prescription medications and had not taken any medications, prescription or nonprescription, in the 72 hours before the accident. The First Officer drank alcohol at social events and smoked about half a pack of cigarettes per day on trips, less when he was at home in Brunswick. He was not aware of having any medical conditions before the accident.

The First Officer had called in sick July 17-19, 2002 because of a minor knee injury suffered while playing sports. The injury recovered sufficiently for him to return to duty by July 20.

The First Officer reported no major changes in his personal life in the previous 12 months.

The First Officer's preferred work schedule was to fly one week on, one week off, with early morning launches (departures between 0200 and 0300). When he was not working, the First Officer typically went to bed about 2100, fell asleep about 2200, and awoke about 0600.

A search of records at the National Driver Registry found no history of driver's license revocation or suspension.

First Officer's 72-Hour History

The First Officer was on Reserve duty. He was holding a R24 line this month[8]. On Tuesday, July 23, 2002, the First Officer finished a trip he considered very difficult because the trip consisted of three legs, was long, and was conducted during the early morning hours, between 0330 and about 1100. After the trip, he went to an apartment he leased with a few other Federal Express pilots and then went to sleep around 1130. He did not recall how long he slept, but he recalled waking in the evening and going out for dinner. He went to sleep again later that evening, but he could not recall the time.

On Wednesday, July 24, 2002 the First Officer awoke in the morning. He could not recall the time of his waking. He engaged in routine activities around his apartment during the day and ate dinner with his landlord in the evening. He went to bed around 2100, getting "a couple hours of sleep" before he left for the airport after midnight.

[8] See Jim Kirby interview in the Operations Factual Report in the Public Docket for information on reserve lines.

On Thursday, July 25, 2002, the First Officer checked in at the AOC at 0300. The First Officer departed MEM on Flight 0134 at 0356, arriving YWG at 0645. He went to a hotel and slept five or six hours. He got up in the early evening and had dinner. The quality of his sleep was "no better or worse than most day sleeps." The First Officer reported for duty in Winnipeg at 1818. He departed YWG on Flight 0137 at 1902, arriving Grand Forks, North Dakota, (GFK) at 1935. He departed GFK on Flight 0137 1 hour and 22 minutes later at 2057, and arrived at MEM at 2303. After arriving at MEM, the First Officer received notification that he had been scheduled to work Flight 1478 to TLH, departing at 0312.

Because he was notified about the trip to TLH with less than 24 hours notice, he inquired with a company duty officer about the legality of the assignment. After speaking with the duty officer, and reviewing a section of the union's bargaining agreement pertaining to R24 reserve scheduling, he accepted the trip. The First Officer slept for about an hour and a half in a private sleep room in AOC crew rest facilities. After sleeping, the First Officer had coffee, met the Captain, reviewed departure paperwork for Flight 1478, and then proceeded to the aircraft. Departure was delayed because one pallet loaded on the aircraft at MEM exceeded maximum weight requirements. The load was adjusted, and the crew proceeded with pushback at 0324, twelve minutes behind schedule.

Second Officer David J. Mendez

Date of birth: [redacted] 1969
Date of hire with Federal Express: September 3, 2001
Airline Transport Pilot Certificate (December 14, 2000)
Airplane Multiengine Land
Commercial Privileges: Airplane Single Engine Land
Type Ratings: None
Flight Engineer Certificate (March 15, 2002)
Turbojet Powered
Medical: First Class (July 8, 2002)
Limitations: None

Flight Times[9]:
Total flying time: 2,600 hours[10]
Total Federal Express flying time: 346.2 hours
Total Federal Express Flight Engineer (F/E) B727: 346.2 hours
Total flying time last 24 hours: 6.3 hours
Total flying time last 7 days: 6.3 hours

[9] Total times include the accident flight.

[10] Estimated by Second Officer Mendez.

Total flying time last 30 days: 27.1 hours
Total flying time last 90 days: 166.8 hours
Total flying time last 12 months: 346.2 hours
Initial ground training: September 28, 2001
Completed Initial training Simulator: October 22, 2001
Completed F/E IOE: November 8, 2001
Initial F/E Line Check November 8, 2001
Last F/E proficiency training Simulator April 8, 2002

The Second Officer was 33, married (12 years), with three young children. He lived in Hagaman, New York.

The Second Officer learned to fly in the U.S. Navy in 1994 where he flew Lockheed P-3 Orion aircraft. He was hired by Federal Express on September 3, 2001, and continued to serve as a pilot in the U.S. Navy reserves at the time of the accident. He reported 2,600 hours total flight experience, with approximately 300 hours as a flight engineer on the B727. A Federal Express Captain who had flown with the Second Officer on a four-leg trip on July 25, 2002 described him as very professional and courteous, with good CRM skills, adding that he knew his job and was proactive. The Second Officer's proficiency check records were satisfactory.

The Second Officer recalled taking fatigue management training at Federal Express. He said it addressed the "sleep bank" and other issues. According to the Second Officer, the training encouraged pilots to speak up when tired, to stretch, and suggested asking the Captain turn on the lights in flight as necessary to maintain alertness. After receiving this instruction, the Second Officer began taking naps as a fatigue countermeasure when not on a flight. He had never turned down a trip because of fatigue.

The Second Officer was in good health. His last medical certificate, dated July 8, 2002, contained no restrictions. He had visited a chiropractor for back pain during the previous twelve months, but reported no other changes to his health. He was not taking prescription medications at the time of the accident, and stated that he had not taken any medications in the 72 hours before the accident. He drank alcohol occasionally, but had not had any alcohol since July 21.

Changes in his personal life during the previous twelve months included: leaving military active duty, starting a new job, and making preparations to purchase a home. He also had a job interview coming up. He had applied for a position as a Federal Express Line Check Airman and was scheduled to be interviewed for that position in Memphis on the morning of July 26, 2002. The Second Officer reported no other major changes in his personal life. When he was not working, the Second Officer typically went to sleep around 2230 and awoke around 0630.

A search of records at the National Driver Registry found no history of driver's license revocation or suspension.

Second Officer's 72 Hour History

The Second Officer was on Reserve duty and held a R24 line this month[11]. On Tuesday, July 23, the Second Officer awoke between 0900 and 0930. He spent the day relaxing around the house because he had been experiencing back pain. That evening he went to bed about 2200.

On Wednesday, July 24, the Second Officer awoke around 0800. His back was feeling better, so he went boating from 0900 to 1100. He took a nap from 1300 to 1550, then engaged in routine activities at home until it was time to go the airport. He had a 2100 show time for a deadhead trip to Memphis. On this flight, he took a 30 minute nap. He arrived in Memphis at 2330, found a recliner in Federal Express' crew rest facilities, and slept about 90 minutes.

On Thursday, July 25, the Second Officer had a show time of 0248 for a trip to Ottawa International Airport (YOW). Flight 0180 departed Memphis at 0358, stopped at Buffalo Niagara International Airport (BUF), New York for 28 minutes. The flight departed BUF at 0626, arriving YOW at 0714. The Second Officer was in his hotel approximately 20 minutes after arrival. He slept approximately six and a half hours. After waking, he received notification of his assignment to the trip to TLH. As a result, he postponed a job interview for a Federal Express B727 Second Officer line check airman's position, originally scheduled to take place in Memphis the next morning. He engaged in routine activities around the hotel during the late afternoon and early evening, returning to the airport by 1806. After a two-hour delay waiting for a shipment, the Second Officer departed YOW at 2139 on Flight 0181, arriving at MEM at 2359.

On Friday, July 26, after arrival at MEM, the Second Officer had his fingerprints taken to satisfy a new security policy around midnight. Next, he relaxed in a recliner chair for 30 to 60 minutes, but "probably did not sleep." He began preparing paperwork for Flight 1478 in the AOC building at 0135. He recalled feeling fairly rested. He saw the Captain in the flight operations center, but did not talk with him or with the First Officer until they met in the airplane. After preparing the departure paperwork he went out to the aircraft to perform a preflight inspection. He greeted the other two crewmembers there. Departure was delayed because one pallet loaded on the aircraft at MEM exceeded maximum weight requirements. The load was adjusted, and the crew proceeded with pushback at 0324, twelve minutes behind schedule.

1.6 Aircraft Information

[11] See Jim Kirby interview in the Operations Factual Report in the Public Docket for information on reserve lines.

The aircraft was properly certificated and airworthy at the time of the accident. The aircraft, including the structures, systems and powerplants, was properly performing at the time of the accident. Jet A Fuel was used during the flight. The aircraft was within CG limits and was under the maximum landing weight at the time of the crash. The only open MEL item on the aircraft was MEL 34-14-01 for an inoperative Captains rate of turn needle. No maintenance trends were found in the maintenance records for the 90 days prior to the accident.

1.7 Meteorological Information

The observation at TLH near the closest time of the accident was:

KTLH weather at 0953Z: wind calm, visibility 8 miles, a few clouds at 100 feet, scattered clouds at 15,000 feet, scattered clouds at 25,000 feet, temperature and dew point 22 degrees C, altimeter 30.11 inches Hg. Remarks: automated observation, sea level pressure 1019.2 mb, temperature 22.0 C, dew point 21.7 C.

Night visual meteorological conditions prevailed, and there was 95% illumination from the moon at the time of the crash.

The last observation obtained by the accident flight was the 0853Z observation. The flight crew obtained this observation from the Gainesville Flight Service Station (FSS). The 0853Z observation was:

KTLH weather at 0853Z: wind 120 degrees true at 5 knots, visibility 9 statute miles, a few clouds at 100 feet, scattered 8,000 feet, scattered 25,000 feet, temperature and dew point 22 degrees Celsius (C), altimeter 30.10 inches of Mercury (Hg). Remarks: automated observation, sea level pressure 1019.2 mb, temperature 22.2 degrees C, dew point 21.7 degrees C, 3-hour pressure tendency decreasing 0.3 mb.

1.8 Aids to Navigation

The accident flight was using Runway 9. Runway 9 has high intensity runway lights (HIRL), runway centerline lights (CL), and runway end identifier lights (REIL). There was a 4-light, precision approach path indicator (PAPI) located on the left hand side of runway 9 with a published 3-degree visual glideslope, for flight path guidance and reference. The PAPI was functional and operating at the time of the accident.

1.9 Communications

TLH ATCT operates part time and was closed from 0300Z to 1000Z. When TLH ATCT is closed, the airspace is normally delegated to TLH TRACON and ATCT reverts to Jacksonville Center (ZJX). During the approach and landing at TLH, FDX1478 was under control of ZJX sector R28.

The crew of FDX1478 contacted the ZJX R28 controller at 0915:48, stating, "Jacksonville Center, uh good morning FedEx fourteen seventy eight two nine oh discretion to two four oh." The R28 controller responded, "FedEx fourteen seventy eight JAX center roger descend at pilot's discretion maintain niner thousand Tallahassee altimeter three zero one zero." The crew acknowledged. At 0918:30, the crew of FDX1478 transmitted, "Atlanta FedEx uh fourteen seventy eight leaving two nine oh for nine thousand." The R28 controller acknowledged. At 0922:42, the R28 controller transmitted, "FedEx fourteen seventy eight descend at pilot's discretion maintain three thousand," and the crew responded, "Discretion to three thousand FedEx fourteen seventy eight." At 0923:29, the R28 controller instructed the crew to change to frequency 135.32, and the crew acknowledged. At 0923:45, the crew of FDX1478 reported on the new frequency. At 0923:49, the R28 controller acknowledged the crew's check-in and asked if the crew had the TLH weather. The crew of FDX1478 responded, "Yes, sir, we do FedEx fourteen seventy eight." At 0923:58, the R28 controller told the crew to expect a visual approach and to report the airport in sight. The crew read back the instructions. At 0929:55, the crew of FDX1478 stated, "Jacksonville FedEx uh fourteen seventy eight we have the airport." The R28 controller replied, "FedEx fourteen seventy eight cleared visual approach into Tallahassee. Are you showing the uh NOTAM Tallahassee runway one eight three six is closed?" The crew responded, "Uh no sir but we're going to use runway nine." At 0930:12, the R28 controller transmitted, "All right you're cleared for the visual approach and report your down time this frequency if unable to Gainesville radio change to advisory approved." At 0930:12, the crew of FDX1478 responded, "FedEx fourteen seventy eight good morning."

There was no further air traffic control contact with the aircraft. The last recorded radar return for FDX1478 was at 9:37:22.97.

1.10 Aerodrome Information

Airport Information

Tallahassee Regional Airport (TLH) is approximately 2,700 acres in size and is located in the city of Tallahassee, Leon County, Florida. The airport is positioned at 30°23'47.52"N and 84°21'01.25"W at an elevation of 81 feet. TLH is certificated under Title 14 Code of Federal Regulations (CFR) Part 139.

The airfield consists of two precision instrument runways. Runway 9-27 is 8,000 feet long and 150 feet wide. Runway 18-36 is 6,066 feet long and 150 feet wide. Both runways are constructed of grooved asphalt and are accessible by parallel taxiways. Runways 36 and 27 have instrument landing system (ILS) approaches. At the time of the accident, runway 18-36 was closed for construction. Notice to Airman (NOTAM) #02-47 was issued July 19, 2002, indicating the runway closure.

The average runway gradient for runway 9-27 is -0.2 percent from the runway 9 threshold, and conversely, 0.2 percent from the runway 27 threshold. Runway 9-27 has an elevation of 49.0 feet mean sea level (MSL) at the runway 9 threshold, and 61.2 feet MSL at the runway 27 threshold. The high point for runway 9-27 is 70.5 feet MSL and is located approximately 2,325 feet from the runway 9 threshold. From the runway 9 threshold to the high point, there is an increase in elevation of 9.3 feet, which produces a runway gradient between these two points of 0.4 percent.

According to Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, *Airport Design*, "The maximum allowable longitudinal runway gradient at airports with Approach Categories C and D, is plus or minus 1.5 percent; however, the gradient may not exceed 0.8 percent in the first and/or last quarter of the runway length." Runway 9-27 at TLH did not exceed the FAA design criteria for runway gradient at the time of the accident.

The TLH Airport Layout Plan (ALP) includes a note (#2) stating: "The existing longitudinal grade changes associated with the centerline of runway 9-27 exceed recommended surface gradient standards as provided in chapter 5 of FAA Advisory Circular 150/5300-13, *Airport Design*." When asked about this note during the investigation, the TLH Capital Program Administrator explained that, "…the note on the ALP is in error, and should read that we [TLH] have a non-standard line of sight for runway 9-27, vice a non-standard longitudinal gradient." Also, the runway data chart on the TLH ALP lists the effective gradients (%) for runways 9 and 27 as "-0.2 percent" and "0.2 percent," respectively. TLH personnel explained that the published values actually reflect the *average* runway gradient instead of the *effective* runway gradient (emphasis added).

Airport Lighting

At the time of the accident, the TLH air traffic control tower (ATCT) was closed. The towers operating hours were between 2300 and 0600 local time, daily. During hours that the ATCT was closed, all runway, taxiway and approach lighting systems on the airfield were pilot controlled.[12] The runway inspection log indicated that the runway lighting was operational as of July 25, 2002, and the lighting activation log indicated that the airfield lighting was on at the time of the accident.

[12] When the ATCT is closed, the field lighting can be activated by tuning the airplane radio to control tower frequency and "keying" the microphone. According to TLH officials, 7 clicks of the microphone turn the system on to high intensity. The light intensity can then be reduced to low (3 additional clicks) or medium (5 additional clicks) intensity.

The lighting activation log indicated that runway 9 lighting systems had been activated at 04:37:42 local time (L) and all lights were on at 04:37:47L.[13] Examination of the computer that controlled the lighting log indicated that the computer time had not been adjusted for daylight savings time, and also, was 3 minutes and 16 seconds ahead of the time displayed on a global positioning system (GPS) receiver, producing a 56 minute, 44 second difference. Applying the difference as a correction factor to the time indicated on the activation log, the approximate time that the airport lights were activated was 05:34:26L, and all lights were on at 05:34:31L. The runway 9 precision approach path indicator (PAPI) was not specifically indicated on the lighting activation log. According to TLH electrical technicians, the runway 9 PAPI received electrical power from the circuit that powered the runway 9-27 high-intensity runway edge lights (HIRLs).

Runway 9-27 Lighting

Runway 9-27 was equipped with HIRLs, with in-pavement centerline lights and touchdown zone lights. Runway 27 had an ILS approach lighting system (ALSF-2), which was owned and maintained by the FAA, and a PAPI. Runway 9 had runway end identifier lights (REILs) and a PAPI.

Runway 9 PAPI

ADB, ALNACO, INC., a subsidiary of Siemens Airfield Solutions, manufactured the PAPI lighting system installed at the approach end of runway 9. It was a model L-880, style A, consisting of 4 identical light units mounted on the left side of runway 9, along a line perpendicular to the runway centerline, approximately 1000 feet from the runway 9 threshold. Each of the light units contained two 200-watt lamps, and optical apparatus to split the lamp beams horizontally into red (lower) and white (upper) beams, with a transition zone between the red and white beams of 3 minutes of arc at the beam center. The light units were individually positioned to project signals at prescribed angles above the horizontal, relative to a 3-degree glideslope. When energized, the light units operated at 100% intensity during daylight hours, and at 20% intensity during darkness. The day/night intensity settings were switched automatically by a photocell. Each light unit had an internal "tilt switch" to shut off the entire system if any of the units became misaligned.

According to a representative of Siemens Airfield Solutions, the red filters in the ADB PAPI systems conform to Military Standard (MIL-C-L5050) for "aviation red" coloring, as outlined in FAA AC 150/5345-28D. Siemans does not recommend periodic replacement of the filters, as they are expected to retain accurate coloring for the life of the PAPI system.

[13] The airfield lighting circuits are activated sequentially over a period of a few seconds.

The runway 9 PAPI system had not been certified by the FAA at the time of the accident.[14] According to electrical technicians at TLH, the PAPI lighting system on runway 9 had been checked with the manufacturer-provided sighting tool "5 to 6 times" since its installation in 1996, and had not been found to be out of alignment during these inspections.[15]

On July 29, 2002, the FAA performed an after-accident flight inspection of the runway 9 PAPI system. The flight inspection report was generated from the flight stated:

> "There is no electronic glide path to this runway, and, at the time of this inspection, there was no reference data (lat/long) available for the PAPI's on this runway. Consequently, a PAPI angle was not determined through AFIS [automated flight inspection system]. This evaluation was conducted by flying one approach with on-path indications, and one approach at an angle consistent with the last box just turning red. On both approaches, the glidepath flown was well clear of the terrain and obstacles in the approach zone."

Following the flight inspection, TLH obtained current survey data for the airport and provided it to the FAA. A second flight inspection was performed on August 6, 2002. The flight inspection report from the second flight stated, "average PAPI angle at 2.90 degrees."[16]

On October 10, 2002, a ground inspection of the TLH runway 9 PAPI light units was conducted. In attendance were representatives from TLH airport and FAA Airways Facilities. TLH electrical technicians, using the manufacturer-supplied aiming tool in accordance with the manufacturer's instruction manual,[17] checked the settings for each of the light units. The observed settings were consistent with

[14] There is no requirement for an airport to have FAA certification of a PAPI lighting system when a FAA-approved aiming device (e.g., Walker tool) is used to maintain the system. TLH uses a FAA-approved aiming device.

[15] No record or log of inspections of PAPI lighting systems is maintained at TLH.

[16] FAA Order 8200.1, *Flight Inspection Handbook*, states: "precise measurement of the [PAPI] elevation angle cannot be made by flight inspection due to the various widths of the on-path indication of 0.25 degrees to 0.50 degrees. Initial settings are determined by ground adjustments and verified by flight inspection." The Order allows +/- .2-degree variation between flight inspection measurement and ground settings.

[17] ADB, ALNACO, Inc. Document No. 96A0136.

the recommended settings for a standard PAPI installation as specified in the ADB, ALNACO instruction manual.[18]

Effects of Surface Contamination on PAPI Lenses

In April 1983, the FAA published the results of a research project designed to assess the attributes of PAPI systems as compared to Visual Approach Slope Indicator (VASI) systems. The final report, *Evaluation of Precision Approach Path Indicator (PAPI),*[19] included collateral information describing PAPI signal anomalies that occurred as a result of moisture accretion on the surface of PAPI lenses. In field observations, the FAA found that, "the Belgian ADB PAPI units tended to form condensation on the exposed frontal surface of the lenses during high humidity conditions while the system was de-energized. Upon energization, diffusion and mixing of the projected colors created a broad 'pink' signal, which could not be easily interpreted."

Similarly, in controlled experiments in an environmental chamber, artificially applied condensate (steam) on the PAPI lenses produced "a uniform distortion of the projected signal that was perceived as a pink overall signal." In both field and controlled tests, the FAA noted that "correct color signals" and "normal signal presentations" were evident when the lenses were clear of condensation. The FAA report concluded that the "transient false pink signals" could be eliminated by three methods: 1) energize system continuously; 2) energize system at least 30 minutes before flight operation; or 3) install heaters in close proximity to the lenses. The FAA does not address lens contamination in its PAPI guidance material.[20]

On August 16, 2002, a representative of Siemens Airfield Solutions was contacted by telephone to discuss the issue of PAPI lens contamination. The representative stated that, "the company was aware of TC's Aerodrome Safety Circular, however, since regulatory authorities do not require deicing or defrosting provisions for PAPI systems, such devices are not included as standard equipment in ADB PAPI systems." Siemens offers optional heating units that can be installed in the light units; however, according to the Siemens representative, "customers do not often request them." The Siemens representative emphasized that the standard units produce substantial heat, and will "burn off any traces of

[18] Manufacturer recommended settings are: Unit 1 at 3°30'; unit 2 at 3°10'; unit 3 at 2°50'; unit 4 at 2°30' (unit 1 being closest to the runway edge and each numbered unit proceeding outward to the next adjacent unit).

[19] DOT/FAA-RD-82/85, Bret Castle, 1983

[20] FAA Advisory Circular 150/5345-28D, *Precision Approach Path Indicator (PAPI) System*, details performance standards for PAPI installations.

dew or frost within minutes." He said that Siemens recommends that the lighting units be activated a few minutes prior to using the system.

Obstructions

The annual airport certification inspection, conducted on June 20-21, 2002 by the FAA, found no obstructions to the Federal Aviation Regulation (FAR) Part 77 (Obstructions to Air Navigation) surfaces to any of the runway ends, nor were any obstructions identified during the past three annual certification inspections.

Survey data of the runway 9 approach, taken during the onsite portion of the investigation, indicated that no obstacles penetrated either the FAR Part 77 approach slope or the PAPI obstacle clearance surface.

As previously stated, the FAA flight inspection conducted on July 29, 2002, noted that the runway 9 PAPI glidepath was "well clear" of the terrain and obstacles in the approach zone.

Construction Hazards

There was an airport improvement project in progress at TLH near the runway 9 approach end at the time of the accident. NOTAM # 02-06, issued January 15, 2002, addressed the project. Construction vehicles and equipment were located in a staging area outside of the airport operations area (AOA), behind a gated perimeter fence. At the time of the accident, no construction activity was underway and all construction equipment was in the staging area.

1.11 Flight Recorders

The Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) were both located in the tail section of the aircraft. The tail section survived the fire relatively intact. Both recorders were recovered in excellent condition with no signs of distress.

The solid state FDR, Solid State Universal Flight Data Recorder part number 980-4120-KXUS with the serial number of 2343, was removed from the main wreckage and sent to the National Transportation Safety Board in Washington, D.C. for download and analysis. All 27.07 hours of recorded data were successfully downloaded. For the accident flight, the FDR data indicated the previous takeoff at Memphis, Tennessee occurred at approximately 3,560 SRN[1] with the final FDR data recorded at 7,201 (9:37:25.04 local time). Hence, the accident flight FDR data lasted approximately 1 hour and 41 seconds in duration.

The CVR contained approximately thirty-two minutes of quality audio. The recording began at about 05:05:14 EDT during cruise flight, and ceased at about 05:37:26 PST.

1.12 Wreckage and Impact Information

The wreckage path was divided into two areas. The first area was the tree impact area extending from 3,650 feet to 2,520 feet as measured from the runway pavement edge, for a distance of approximately 1,130 feet. (Note: All distances mentioned in this section are measured from the runway 09 pavement edge.) The second area was the open terrain area that extends from 2,520 feet to 1,556 feet, i.e. from the tree line to the main wreckage. The main wreckage was located 1,556 feet from runway pavement (RP) and comprises of the fuselage, left wing, and the empennage.

The wreckage was spread across the tree covered ground and an open terrain over a distance of 2,100 feet. The first contact point of the airplane was with a tree that was approximately 3,650 feet from RP, and broke at 48.3 feet above the ground. Ground elevation at this tree location was 100 feet mean sea level (MSL). Several trees were impacted along the flight path for a distance of approximately 1,130 feet, which was the tree-impact area of the wreckage path. The width of the tree swath at the beginning of the tree impact area measured 90 feet, and gradually narrowed down to 42 feet at the end. The height of the broken trees at the narrow end of the swath was 7.9 feet on the right side and 31.7 feet on the left side of the swath. The ground elevation at the end of the tree swath measured 88 feet MSL. There was no evidence of any fire in the tree impact area of the wreckage path.

The first ground scar from the aircraft was located about 2,690 feet from RP. This ground scar was approximately 45 feet long, 3 feet wide and 1 foot deep, fan shaped and was located in the middle of the tree swath. The elevation at this location measured 89.7 feet MSL.

Some important data points:

Aircraft resting Heading: 260 degrees
Runway elevation at RP: 59.9 feet MSL
Average height of unbroken trees: 48 ft
Elevation at first ground scar: 89.7 feet MSL
Elevation at first impact tree: 100 feet MSL
Elevation at last impact tree: 88 feet MSL
Elevation at the main wreckage: 64.4 feet MSL

1.13 Medical and Pathological Information

Official reports of the toxicological test results for each pilot were provided by the manager of the FAA's Toxicology and Accident Research Laboratory. Those reports are contained in the Public Docket of the accident.

Emergency room personnel at Tallahassee Memorial Hospital collected blood and urine specimens from the Captain at 0614 and 0714, respectively, on July 26, 2002. The blood specimen tested negative for ethanol and a wide range of drugs, including major drugs of abuse. The urine specimen tested positive for morphine (1.306 ug/ml) and acetaminophen (15.57 ug/ml). However, a review of emergency room hospital records indicated that the Captain was administered morphine intravenously at 0640, as part of his medical treatment on July 26, 2002.

Emergency room personnel at Tallahassee Memorial Hospital collected Blood and urine specimens from the First Officer on July 26, 2002. These specimens tested negative for ethanol and a wide range of drugs, including major drugs of abuse.

Emergency room personnel at Tallahassee Memorial Hospital collected Blood and urine specimens from the Second Officer on July 26, 2002. These specimens tested negative for ethanol and a wide range of drugs, including major drugs of abuse.

1.14 Fire

Aircraft N497FE was consumed by fire post accident.

1.15 Survival Aspects

All three crewmembers survived the crash and subsequent post accident fire. All three crewmembers exited out the Captains side sliding window. The Captain was the first to exit. The Captain then helped the First Officer and the Second Officer exit the aircraft.

1.16 Tests and Research

Fuel samples were taken from the No. 2 engine's filter bowl. Fuel samples from the No. 1 and 2 sumps and filters from the cart that serviced N497FE prior to departing Memphis for Tallahassee. No issues were noted with the fuel samples provided.

Several PAPI tests were completed. The test results can be found in section 1.10 of this submission.

Pathological tests were performed on all three crewmembers. The results of these tests can be found in section 1.13 of this submission.

The First Officer was tested at Brooks Hospital in San Antonio, Texas on February 25, 2003 with regard to the color deficiency listed on his medical. At the time of this writing, the results of those tests were not available.

1.17 Organizational and Management Information

In accordance with the FARs, Federal Express has the appropriate management personnel and controls to manage its extensive flight operation. The Federal Express Flight Operations Manual (FOM) and the B727 Company Flight Manual (CFM) are approved by the FAA and contain all the appropriate information and direction to conduct safe, legal operations.

Federal Express' training programs are approved by the FAA and adhere to the FARs. Federal Express normally conducts all training for its crewmembers using its own employees, facilities and curricula. If Federal Express dry leases a simulator to conduct training, we use our own instructors and curriculum.

Federal Express adheres to the Collective Bargaining Agreement (CBA) with ALPA and expects it pilots to do so also. Crewmembers are scheduled in accordance with the CBA. The CBA has requirements that crewmembers report fit for duty. If crewmembers are unable to report fit for duty, the CBA has requirements and provisions for the crewmember to call in sick or fatigued as appropriate. Crewmembers are paid for time off when sick or fatigued. See relevant excerpts in attachment A.

1.18 Additional Information

Federal Express reserves the right to amend its submission based upon the test results of the PF at Brooks Hospital in San Antonio, TX.

Crew Training and Certification:

The Captain, the Pilot Not Flying (PNF), was properly certified in accordance with the Federal Aviation Regulations. Federal Express hired the PNF as a line crewmember on August 6, 1992. Federal Express Corporate Aviation had previously employed him as a Captain. He was qualified as a B727 Flight Engineer on October 18, 1992. He completed Upgrade Training as B727 First Officer on August 1, 1995, and completed Transition Training as a DC-10 First Officer on October 24, 1996. All training and evaluations to date were satisfactory. On August 27, 1999, the PNF completed Initial Training as a Captain on the B727. In addition to Initial Training, the PNF completed the following Recurrent Training; Proficiency Training (PT) on February 14, 2000, Warm Up Training (WU) on August 4, 2000, Proficiency Check (PC) on August 5, 2000, PT on February 15, 2001, WU on August 12, 2001, PC on August 13, 2001, and PT on February 15, 2002. In addition, the PNF received International Training for South American Operations on August 8, 2001. All training and evaluations to date were satisfactory.

The First Officer, the Pilot Flying (PF), was properly certified in accordance with the Federal Aviation regulations. Federal Express hired the PF on October 29,

1997. He was qualified as a B727 Flight Engineer on December 23, 1997. All training and evaluations to date were satisfactory. On June 21, 2001, the PF completed Upgrade Training to B727 First Officer. In addition to Upgrade Training, the PF completed the following Recurrent Training; PT on December 18, 2001, WU on June 18, 2002, and a PC on June 19, 2002. The PF has logged 525.9 hours as a B727 First Officer. All training and evaluations to date were satisfactory.

The Second Officer was properly certified in accordance with the Federal Aviation Regulations. Federal Express hired the Second Officer on September 3, 2001. On November 8, 2001, he completed Initial Training as a Flight Engineer on the B727. In addition to Initial Training, he completed PT on April 8, 2002. The Second Officer has logged 346.2 hours as a Flight Engineer on the B727. All training and evaluations to date were satisfactory.

All crewmembers had extensive training in the following areas that are relevant to this accident; Visual Approaches, Non Tower Operations, and Controlled Flight Into Terrain (CFIT). B727 Flight Standards advises the training department when operational requirements dictate special training. Some of those requirements include flights in and out of non-tower airports, mountainous terrain, and CFIT Risk Assessment. To that end, approximately 30 minutes of the Comprehensive Oral given on the Captain and First Officer Rating/Type Ride includes questions that test the crewmember's knowledge in these vital areas. B727 Flight Training provides the training to meet Flight Standards' tasking. The training is provided in the following areas using the methods indicated:

Visual Approach Training

Visual Approach Training is provided to all Captains and First Officers during Upgrade and Transition in a "Building Block" format, covering many different aspects of the maneuver. Visual Approach procedures are introduced during the Flight Training Device Phase by way of briefings using CFM, Chapter 7, as the foundation. Visual approaches are trained on all Advanced Simulator Training (AST) sessions (full motion, full visual) with no electronic glide slope, no visual landing aids, and with cross winds that reach the operational limit of the aircraft for various runway conditions. Various configurations of flap settings and inoperative engines are trained, with the emphasis being on the maneuver always culminating in a successful visual landing. Crewmembers are evaluated by Flight Standards on the Rating or Type Ride under the same conditions, but with slightly less cross wind. During Initial, Transition and Upgrade (I/T/U) training a 2-day course on the FOM and Jeppesen Procedures provides training on airport lighting and the various visual landing aids available to assist in a visual approach. The instructors highly encourage all crewmembers to place the Jeppesen provided lighting diagrams in the front of their "Trip Books" to refresh their memories as to the various

lighting configurations. During all recurrent training, visual approaches are trained and evaluated. The same conditions of varied aircraft configuration, crosswinds, contaminated runways, and engine out conditions that are trained and evaluated during I/T/U Training are used during Recurrent Training. Visual approaches, airfield lighting, and landing aids are also discussed during the International Training Course. (attachments B and C)

Non Tower Operations Training

During Captain and First Officer I/T/U training, a 2-day course on FOM and Jeppesen Procedures thoroughly trains Non-Tower Operations. Non-Tower Operations are also covered during the International Training Course. Numerous briefings provided throughout the Captain and First Officer I/T/U courses address Non-Tower Operations. A practice "Comp Oral" given on the day before the Captain and First Officer Rating/Type ride covers the subject in great depth. When discussing Threat and Error Management during recurrent training, it's pointed out to crewmembers that landing at a Non-Tower field is a "significant" threat. Detailed procedures on Non-Tower Operations are provided in the FOM. All Captains and First Officers are required to carry this document on every flight (attachment C).

CFIT Training

All recurrent training, as well as I/T/U training, incorporate "Black Hole" approaches, one of the major contributors to CFIT accidents. This training is provided using a non-precision approach to a poorly lit runway over unlit terrain. The final portion of this maneuver is trained under visual conditions. All crewmembers also receive "Black Hole" training during Computer Managed Instruction (CMI) completed in I/T/U and recurrent training. Several CRM and "Hot Topic" briefings covering CFIT have been provided to crewmembers during recurrent training sessions. These briefings cover:

a.) Threat and Error Management
b.) Korean Air Lines Flight 807
c.) Black Hole Approaches
d.) CFIT Risk Assessment
e.) CFIT information on Jeppesen 10-10 and 10-10A page

Special "South America" training, which the Captain attended, discusses the American Airlines CFIT accident in Cali, Columbia. CFIT is also addressed during International Training using the Cali accident.

The Airport Performance Laptop Computer (APLC) provides a CFIT Risk Assessment rating when landing data is computed.

See attachment D for further information on CFIT.

Crew Resource Management Training

Crew resource management (CRM) training has been provided to Federal Express pilots since 1989. CRM instruction modules were developed by a staff of seven company instructors who reported to the Senior Manager of Training.

Each year since 1989, Federal Express CRM instructors have developed a CRM presentation to be included as part of recurrent training. Recurrent training was provided in a lecture format with interactive case studies. No exams were given as part of this training. Past topics have included fatigue management, conflict management, "hurry up syndrome", black hole approaches, situational awareness, decision making in critical situations, mediated debriefs, CFIT awareness, monitoring and challenging, and threat and error management. When each recurrent training module was replaced by a newer presentation, parts of the old presentation were integrated into a baseline indoctrination course for new Second Officers. At the time of the accident, CRM instructors were developing a new recurrent training module, "Flight Deck Distractions" for the 2002-2003 training year.

In 1993, a two-day CRM presentation was developed for inclusion in training programs for line check airmen and simulator instructors. In 1997, a CRM module was included in a new two-day Captain's upgrade course. At the time of the accident, a module was under development for inclusion in a new "Second in Command" upgrade course the company was pursuing which would be provided to new First Officers.

From 1989 to 1995, Federal Express' CRM instructors personally developed and delivered all courses. In 1996 and subsequent years, CRM materials included in recurrent training, were delivered by simulator instructors belonging to aircraft-specific training departments. The simulator instructors provided the training in a similar fashion, using computerized slides prepared by the CRM instructors. Company CRM instructors continued to deliver CRM training material in the baseline indoctrination course for new Second Officers, in the Captain's upgrade course, and in the training courses for line check airmen and simulator instructors. (attachment E)

Fatigue Management

Federal Express CRM instructors developed fatigue management training when the company participated in a study of fatigue in aviation conducted by scientists at the National Air and Space Administration. The company's two-hour course on sleep and fatigue management was introduced as recurrent training for all pilots in 1990, and added to the baseline indoctrination course for new Second Officers thereafter. The course addressed causes of fatigue, circadian rhythms, sleep-loss, and the physical, social, emotional, and safety-related consequences of fatigue. Strategies for minimizing and managing fatigue were discussed.

Fatigue management strategies recommended for the home environment included taking steps to prevent interruptions, and ensuring adequate rest before a trip. Recommended strategies for use during trips included: making sleep a priority on layovers, sleeping two or more times per day, developing a regular pre-sleep routine, using relaxation techniques, creating a good sleep environment, and maintaining exercise and a healthy diet. In-flight strategies included interacting with other crewmembers, stretching, turning on lights, maintaining proper temperature, use of caffeine, and napping (in cooperation with other crewmembers). Pilots were encouraged to keep a sleep journal and to learn about their own circadian rhythms and keep notes on what strategies worked best for them.

As part of Federal Express' fatigue management training, pilots were instructed to "call in fatigued" if they were unable to get adequate rest. It was suggested that this would occur sometimes due to circumstances beyond a pilot's control, such as a sick child at home, or construction at the layover hotel. The company preferred for pilots to call in fatigued rather than calling in sick, if fatigue was the reason they were not fit for duty. If they called in fatigued, the company would put them into a rest period, then return them to duty. If they called in sick, the company would not schedule them for duty again until they called back to report that they were fit for duty. Company policy for calling in fatigued is described in the CBA (attachment A).

In 2000, Federal Express CRM instructors developed a fatigue management card, using a format that could be inserted into a Jeppesen binder, and distributed to all Federal Express pilots. (attachment F)

Operational Policies and Procedures

The Federal Express FOM contains specific information and direction to crewmembers on:

- Cockpit Resource Management concepts and principles. (attachment E)
- CFIT risks. (attachment D)
- Fatigue and fatigue countermeasures. (attachment F)

- Non tower operations. (attachment C)
- Stabilized Approach criteria. (attachment G).

Further, Federal Express provides a customized Jeppesen 10-10 page for TLH that delineated how to operate into TLH when the ATC tower was closed. That same Jeppesen 10-10 for TLH delineated the CFIT risk as moderate. (attachment H)

Analysis

The Captain was the Pilot not Flying (PNF), the First Officer was the Pilot Flying (PF). The flight from MEM to the beginning of the approach was normal. The crew had planned for an approach to runway 27, which had an operating ILS. The crew briefed an approach to runway 27, but during the descent into TLH the crew, after some delay and discussion, decided to land on Runway 9. Part of the reasoning to land on runway 9 was due to prevailing winds and possible traffic conflict. The crew asked for a visual approach into TLH. While doing the performance calculations on the Airport Performance Laptop Computer (APLC), the Second Officer noted that TLH was a "moderate" risk CFIT airport (see attachment H). Second Officer reported this fact to the PNF and PF. The Second Officer also confirmed it would be legal to land on Runway 9 and provided the appropriate landing information to the PNF and PF. The visual approach to runway 9 was discussed.

According to the DFDR, the flight was making a left hand dog leg base turn and rolled out on final at about 2.5 miles for a visual approach. Passing 1,000 feet AGL the flight was on speed with the power near idle, and with a higher than normal rate of descent. At approximately 1,000 feet AGL the flight was within glidepath tolerance as evidenced by each crewmember reporting some combination of white and red lights on the PAPI[21]. At approximately 800 feet AGL the rate of descent began to increase to about 1200 feet per minute. By approximately 800 feet AGL they were below the centerline of the PAPI. At approximately 600 feet AGL the aircraft descended beneath the 2.5 degree glidepath of the PAPI.

Approaching 500 feet AGL the aircraft was on speed, well below glidepath, with a high rate of descent, the power near idle (1.1 EPR), and the flaps at 25 degrees. At that point the PNF prompted the PF if he wanted Flaps 30, and the PF replied in the affirmative. After the flaps were positioned the PNF and the Second Officer completed the last two challenge and response items on the "Before Landing Checklist". Then, while the Second Officer completed his silent checklist items on his panel, the PNF transmitted the flight's position and intent to land on runway 9 over the radio. The aircraft continued on speed, with the power

[21] At approximately 1,000 feet and on the appropriate glidepath, the PNF stated he saw white, pink and white, red. The PF stated he saw white, white, red, red on roll out to final approach on runway 9. The Second Officer stated he saw white, pink, red, red.

near idle (1.1 EPR), and a high rate of descent until just before impacting the trees. Just prior to impact, there were some minor corrections to descent rate and power but not enough to prevent impact. The Second Officer called the "Before Landing Checklist" complete four seconds prior to first impact.

After the 1,000-foot call out by the GPWS, the aircraft's first contact with trees was approximately 56.8 seconds later. Normal descent time from the 1,000-foot call out to touchdown is approximately one minute and twenty-seven seconds (based upon a 700-FPM descent). After the 500-foot call out by GPWS the aircraft's first contact with trees was approximately 29.2 seconds later. Normal descent time from the 500-foot call out to touchdown is approximately 43.5 seconds (based upon a 700-FPM descent).

The Second Officer began the "Before Landing Checklist" according to Federal Express procedure. In accordance with Federal Express checklist philosophy, the Second Officer waited for Flaps to go to thirty prior to finishing the last challenge and response items on the checklist and the silent items. The last challenge and response items occurred just after 500 feet AGL. The Second Officer then completed the checklist silent items (see attachments I and J) and called the checklist complete 4 seconds prior to impact.

Chapter 7, page 7-0-1-4, of the Federal Express B727 CFM delineates specific call outs by the PNF for all approaches. One of those mandatory callouts is a call of "Sink Rate" when the sink rate below 1,000 feet is more than 1,000 feet per minute. (see attachment K)

Conclusions

Findings

1. Aircraft N497FE was properly designed and certified in accordance with the Federal Aviation Regulations

2. All crewmembers were properly certified, trained, and current in the B727.

3. All crewmembers were legally scheduled in accordance with the FARs, and the Federal Express/ALPA CBA. As such, they were given the opportunity for adequate rest prior to the accident flight.

4. According to crew statements, all the crewmembers on the accident flight stated they did not feel fatigued prior to the flight.

5. The company has a comprehensive program on fatigue management. Fatigue management is discussed in training and is referenced in the Federal Express/ALPA CBA.

6. The Federal Express flight training program includes training in Visual Approaches, Non Tower Operations, CFIT, CRM, Black Hole and Fatigue Management.

7. The FOM has detailed Information on Visual Approaches, Non Tower Operations, CFIT, CRM and fatigue management.

8. The Second Officer briefed the PNF and PF that TLH was a moderate CFIT risk airport.

9. The PAPI was working properly and within allowed tolerances of FAA Order 8200.1, *Flight Inspection Handbook*.

10. During the approach, at approximately 600 feet AGL the PAPI indications would have been four red lights.

11. Statements from each individual crewmember stated the presence of white lights and red lights at a point on the approach. Based on these statements, Federal Express concludes there is no evidence of any distortion of the PAPI caused by any moisture or dew.

12. During a FAA Flight test the PAPI was found to be at a 2.9-degree angle. The PAPI is published at a 3.0-degree angle[22].

13. Pilot controlled Airport lighting was activated and properly functioning at the time of the accident according to crewmember statements and the tower lighting activation log.

14. DFDR data indicates deviations beyond 1000' a minute on the approach (below 1,000 feet AGL). An advisory call was not made by the PNF as required by the B727 CFM. (See attachment K)

15. Federal Express FOM 6-13 states the criteria for a stabilized approach. Attachment G contains the information that is mandatory for a stabilized approach.

16. Time difference from 1,000 feet to touchdown in a normal descent and landing at 700 fpm versus the accident flight was 30.2 seconds. The Second Officer in completing had 30.2 seconds less than normal to complete his assigned duties. This prevented him from focusing his attention forward to monitor the final portion of the approach.

[22] FAA Order 8200.1, *Flight Inspection Handbook*, allows a +/- .2-degree variation between flight inspection measurement and ground settings.

17. The Second Officer was performing his duties in accordance with stated CFM policies.

Causes

1. The PF failed to maintain a stabilized approach according to the criteria established in the Federal Express FOM, 6-13.

2. The PNF failed to identify an unstabilized approach according to the criteria established in the Federal Express FOM, 6-13, and take proper corrective action.

3. PNF did not make an "Unstable, Go Around" call out at 500 feet AGL as is required by the B727 CFM, page 7-0-1-4.

4. The PF failed to maintain proper glide slope.

5. The PNF failed to recognize deviation from glide slope and correct the PF.

6. The PNF failed to make the required call out when the sink rate increased to more than 1000 feet per minute according to the B727 Manual, page 7-0-1-4.

Safety Recommendations

1. The industry standard altitude parameter at which an approach must be stabilized is 500 feet for a visual approach and 1,000 feet for an instrument approach. Federal Express has now established 1,000 feet as the altitude parameter at which all approaches (instrument or visual) must be stabilized. The FAA should ensure all carriers have criteria for stabilized approaches.

2. Although clearly not a factor in this accident, the FAA should evaluate requiring all airports to comply with the recommendations of the 1983 FAA study "*Evaluation of Precision Approach Path Indicator (PAPI)"* to prevent false PAPI signals. These recommendations include:

   - Energize PAPI system continuously or
   - Energize system at least 30 minutes before flight operation or
   - Install heaters in close proximity to the PAPI lenses

3. Federal Express uses pilot monitoring for certain approaches. However, the concept of "pilot monitoring" throughout all phases of flight is a promising procedure to prevent human factor related accidents. The concept is championed by the Flight Safety Foundation and is in use at US Airways. The FAA has published Advisory Circular (AC) 120-71A titled "Standard Operational Procedures for Flight Deck Crewmembers." This AC delineates

the philosophy and benefits to be derived from a "pilot monitoring" program. The NTSB should recommend the FAA ensure implementation of this important AC as soon as possible.

4. Cockpit Resource Management or Human Factors issues continue to be a major factor in the commercial aviation accidents. The NTSB should recommend the FAA vigorously pursue new advancements to analyze Human Factors' processes, identify the deficiencies in current training, and implement training programs to remediate those deficiencies.

Attachment A

Federal Express/ALPA Collective Bargaining Agreement (CBA)

Pages 14-1 to 14-4 and 26-5

SECTION 14

SICK LEAVE

A. General

1. The purpose of sick leave is to protect a pilot from loss of pay, to the extent of his sick leave accrual, when he is unable to perform his assigned duties because of injury, physical or mental illness, or fatigue.
2. A pilot may review his regular and disability sick account balances in VIPS or other Company computer systems. A pilot shall continue to accrue seniority and longevity while on sick leave.
3. A furloughed pilot shall retain his regular and disability sick accounts as follows:
   a. If a pilot is on furlough on the last day of the fiscal year, the balance of his regular sick account, if any, shall be transferred to his disability sick account or to the surplus program, as appropriate in accordance with Section 14.D. and 14.E.
   b. If a pilot recalled from furlough was not in an active pay status on the first day of the fiscal year, he shall be credited with a pro rata portion of his annual sick leave accrual.
4. If, having exhausted his occupational injury/illness leave, a pilot receives workers' compensation payments and sick leave pay at the same time, he may use only enough sick leave so that the workers' compensation payments plus the sick leave pay equals 100 percent of his BLG/RLG.
5. A pilot who has been removed from a scheduled event and placed on sick leave shall not perform any flight duty during the time that the original event was scheduled to take place, except as follows:
   a. he may be placed back on his original event if it has not been reassigned at the time of his "well call"; or
   b. he may perform a different event as MUS, if that event has a showtime:
      i. outside the footprint of the original event, or
      ii. at least 48 hours after the showtime of the original event.

6. The Company may require a pilot to provide his Regional Chief Pilot with a written statement from the pilot's physician explaining his inability to perform his assigned duties because of illness or injury if:
   a. The Company has a good faith reason to question a pilot's use or attempted use of sick leave; or

      Intent: The concept of a "good faith reason" requires that there be a reasonable, objective rationale, suggesting that a pilot may be abusing sick leave.

   b. The pilot's absence from duty occurred in conjunction with his vacation period or a "holiday." As used herein, "holiday" means Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas Eve, Christmas, New Years Eve or New Years Day; or
   c. The pilot has requested to utilize his disability sick account in accordance with Section 14.D.2.a.
7. A pilot may request to use vacation CH to delay or avoid going on disability.

B. Use of Sick Leave

1. If a pilot has no credit in his regular or disability sick accounts, and would otherwise be in sick leave status, he shall be placed on medical leave of absence.

   Intent: If a pilot has a zero balance in his sick bank, and gets a cold, he will still be removed from trips while he is sick, but he will not receive any compensation. If a pilot has an injury/illness that qualifies for STD/LTD, he will receive disability benefits in accordance with Section 27.

2. Illness or Injury Notification Requirements
   A pilot who becomes ill or injured shall notify the Company via VIPS as soon as possible.
   a. After notification of his illness or injury a pilot shall be placed on sick leave.
   b. Pilots Not on Reserve
      At 0900 LBT each day, any trip with a showtime during the next local base day that is assigned to a pilot who is on sick leave shall be available for open time assignment by CRS.

c. Reserve Pilots

The following shall apply to a reserve pilot who calls in sick for an R-day(s) or a reserve assignment:

i. A pilot holding a line comprised entirely of R-days and who is sick for all such R-days shall be compensated his RLG and shall have his sick leave reduced by such RLG.

ii. A reserve pilot who has been given a reserve assignment(s) prior to calling in sick shall be removed from that assignment(s) commencing at 0900 LBT on the day prior to showtime for that assignment(s) or at the time of the sick call, whichever is later.

iii. A reserve pilot on sick leave shall be assigned open time as if he were not on sick leave (Section 25.G.3. Open Time Assignment and Section 25.M.6. Reserve Assignment Options). A reserve pilot will maintain his leveling position on the reserve list, and the scheduled credit hours for any trips he is assigned and removed as sick will be credited toward his RLG and deducted from his sick bank. Commencing at 0900 LBT each day, a reserve pilot with an assignment(s) having a showtime during the next day shall be removed for sick leave and such assignment be available for open time assignment by CRS.

3. "Well" Call

A pilot who is no longer ill or injured shall notify the Company via VIPS as soon as possible. Except as provided in Section 14.B.4. (fatigue), a pilot shall remain in sick leave status until he notifies the Company via VIPS of his ability to return to flight status and, if applicable, is released by the Company aeromedical advisor to return to duty. He may be given his original assignment(s) if it has not been reassigned to another pilot.

4. Fatigue

A pilot who is unable to operate his trip or a portion thereof due to fatigue shall notify CRS immediately and shall be placed in sick leave status. A fatigued pilot shall be compensated, and his sick leave account(s) shall be debited, for the SCH of the missed trip or portion thereof.

The pilot shall automatically return from sick leave status at the scheduled conclusion of his trip unless the pilot notifies the Company via VIPS to continue his sick leave status. A pilot who is fatigued shall be considered to have an illness or injury. Nothing in this paragraph shall minimize a pilot's responsibility to ensure that he has adequate rest prior to reporting for duty.

5. Ill or Injured During a Trip
   A pilot who becomes ill or injured away from base during a trip shall earn trip guarantee for the entire trip plus actual accumulated overage, if any. He shall be charged sick leave, commencing with the next showtime following his sick call, for the remaining value of his trip. A pilot who becomes ill or injured while away from his base on Company duty shall be provided with proper medical attention, including hospitalization, when required. The Company shall provide transportation, when the pilot is able to travel, back to his base, or at the pilot's option, to his residence provided that the travel cost is limited to the travel cost of returning to base. A pilot whose placement on sick leave causes him to return to base later than scheduled shall not accrue additional CH for that late return.
6. Sick Leave Pay and Account Deductions
   If a pilot is removed from an assigned activity due to sick leave, the following shall apply:
   a. Pilots Not On Reserve (who hold trip guarantee)
      If a pilot is removed from a trip, or portion thereof, for which he holds trip guarantee, he shall be compensated, and his sick leave account(s) shall be reduced by the scheduled credit hours for that trip.
   b. Pilots On Reserve
      i. If a pilot is removed from a reserve assignment due to sick leave, the scheduled CH for the assignment shall be credited toward RLG and leveling and shall be charged to his sick leave account.
      ii. The CH value of an assignment (or portion thereof) shall not be charged to sick leave if it would cause the pilot to exceed RLG.
      iii. Upon his return to flight status, a reserve pilot may be given an assignment(s) for which he is eligible

F. Equipment Damage/Usage

1. A pilot shall not be fined or required to pay for any damage to any Company equipment unless the damage is caused by the pilot's intentional misconduct.
2. A pilot shall not be required to pay for any Company required training or for the use of any required training equipment or facilities.

G. Fitness for Duty

All pilots shall report for duty in proper mental and physical condition.

H. Gender

Masculine pronouns used within this Agreement shall include the feminine unless otherwise specifically provided.

I. Interline and Other Employee Services and Discounts

1. Consistent with the Company's interline agreements with other carriers, if any, all pilots covered under this Agreement and applicable family members and dependents shall be entitled to the same reduced fare privileges generally afforded or available to full-time Company employees and their families.
2. Pilots shall be provided discounts and be eligible to participate in programs, (e.g., ESPP, tuition refund, MedQuest, LifeWorks, Smoking Cessation), to receive Company service awards and to maintain membership in the FedEx Credit Association, so long as these discounts, programs and awards are maintained and continue generally for all full time Company employees and/or their families. This paragraph does not apply to programs within the scope of this Agreement.

J. Jumpseats

1. To the extent permitted by law or regulation, pilots shall be given access to Company jumpseats on terms no less favorable than those provided in the Company jumpseat policy effective January 25, 1998 and included in the PBB. Procedures for booking and other provisions governing access to Company jumpseats shall be as provided in that policy. Jumpseat abuses discovered by flight crews shall be reported through the Association's Jumpseat Committee chairperson and a response to the result of the inquiry shall be returned to the committee chairperson.

Attachment B

B727 Company Flight Manual (CFM)

Non-Precision Approach Information

Page 7-1-7-1

CHAPTER 7-1-7

NON-PRECISION APPROACH

VISUAL APPROACH

DESCRIPTION

This section provides procedures and techniques used to accomplish visual approaches.

Final approach and landing practice will develop the pilot's ability to discern a 2.5° to 3° glidepath. An upslope in either the runway or approach zone creates an "above glidepath" illusion when the actual height is lower than it appears. Under conditions of haze, smoke, dust, glare or darkness, expect to appear higher than the aircraft actually is. Bright runway lights appear closer while dim runway lights appear further away. Wider than normal runways create an illusion of being lower than you actually are. Be alert for depth perception problems on snow-covered runways or when color blends with that of surrounding terrain. Illusions and their effects can be minimized by verifying the approach glidepath with cockpit instrumentation, cross-checks with other crew members and perhaps most important, knowledge and awareness of the special problems associated with these approaches. Abnormal or emergency conditions requiring landings at other than flaps 30° will result in higher than normal pitch attitudes for a given glideslope angle.

Airplane body attitude, rate of descent, and thrust required, can be used along with exterior visual cues to establish or verify a correct final approach visual glidepath. A typical rate of descent for a 3° visual glidepath is about 700 feet per minute (no wind). Realize, however, that rate of descent is a function of ground speed and glidepath angle. Multiplying the ground speed by five will result in the required rate of descent for a 3° glidepath.

A flat approach (below 2.5° visual glidepath angle) is indicated by an increase in thrust required, lower than normal rate of descent, and a higher body attitude. A steep approach (above 3.5° visual glidepath angle) is indicated by a lower thrust setting, higher than normal rate of descent and a lower body attitude. These cues are only true for stable conditions (thrust, body attitude, and airspeed steady).

PROCEDURE

Complete the descent and approach procedures prior to entering the airport traffic area so the flight crew may devote their full attention to aircraft control and traffic avoidance. All radio aids should be used to identify the proper runway. Electronic and visual glideslopes will be used when available. Use of the radio altimeter is optional.

The "Visual Approach" flight profile on the following page, represents the ideal approach situation. Flap and landing gear extension points were selected to minimize crew workload and thrust changes during final approach. The aircraft must be "stabilized" on final approach in accordance with the FOM.

Altitude Callouts

Refer to the Altitude Callouts Chart in this Chapter.

TECHNIQUE

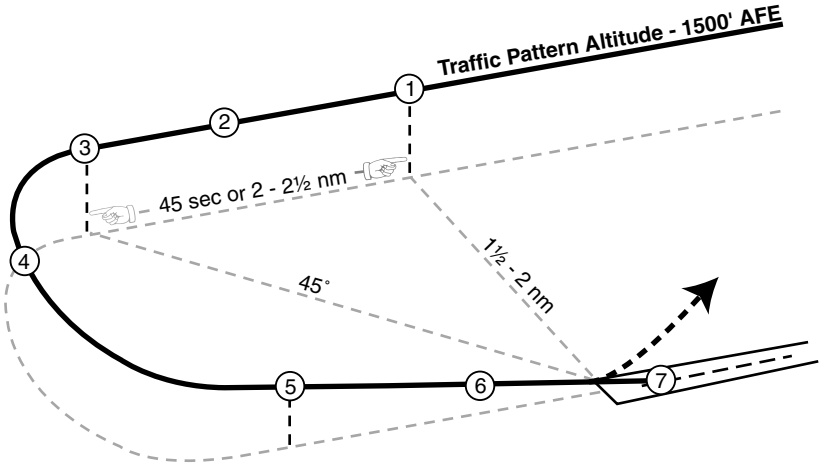
Plan the deceleration and flap extension so as to arrive at a point abeam the touchdown end of the runway (or approximately 5 nm from the end of the runway if flying a straight-in) stabilized with flaps 15°

A typical stabilized final approach for a 3° glideslope, in no wind conditions, will be approximately 1° pitch, 700 FPM, Vapp, and 3000-3500 PPH of fuel flow. The runway should be in the center of the windshield with no movement up or down. Upward movement indicates movement below the glidepath. Downward movement indicates movement above the glidepath. Corrections should be made accordingly.

Adjust thrust smoothly in small increments. Large sudden thrust changes are indicative of an unstable approach.

Prior to entering the visual traffic pattern, complete the In Range and Approach checklist in accordance with Chapter 3. Review the approach and go-around procedures. The final approach speed will be Bug or Vref + Wind, whichever is greater.

Visual Approach



1. Pattern Entry

Configuration - 15° flaps.

Speed - 15° MMS + 10.

2. Landing Gear Extension

Extend landing gear and complete the Before Landing Checklist.

3. Base Turn

Turn base and begin a 300' - 500' FPM descent.

4. Base

Configuration - 25° flaps.

Speed - 25° MMS or Vref + Wind (whichever is greater).

5. Final

Complete the turn to final at an altitude that will allow sufficient time to stabilize by 500' AFE.

Configuration - 30° flaps.

Speed - Bug or Vref + Wind (whichever is greater).

6. 500' AFE

PNF - "Stable" or "Unstable, go-around".

Speed - Bug or Vref + Wind (whichever is greater).

7. Touchdown

Target - 1000' down runway (Fixed Distance Marker on instrument runway).

Speed - Vref-3.

ACCEPTABLE PERFORMANCE GUIDELINES

- Airspeed: ±5 KIAS of target speed on final.
- Rate of descent not to exceed 1000 FPM on final approach.
- Stabilized on final at 500 feet AFE.

COMMON ERRORS

- Poor airspeed control.
- Poor altitude control.
- Failure to stabilize the aircraft on a proper glidepath.
- Late configuration. (excessive airspeed and altitude too close to the runway)
- Failure to correct to a proper glidepath.

Attachment C

Federal Express Flight Operations Manual (FOM)

Non-Operational Control Tower - Arrivals

Pages 6-21 and 6-22

NON-OPERATIONAL CONTROL TOWER – ARRIVALS

Operations into airports during hours when the control tower is closed, or into airports without operating control towers, are not permitted unless the flight crew possesses briefing information describing non-tower operations for that airport.

Briefing information may be supplied as:

- Jepp Insert
- Photocopy of information placed in trip folder
- Information relayed from GOC with authority of Duty Officer

The briefing information contains the following:

- The method for obtaining current weather from an approved source.
- The Common Traffic Advisory Frequency (CTAF).
- The method for obtaining emergency services while on the ground.

After issuing an approach clearance, ATC will clear the flight to "change to advisory frequency." Immediately change to the CTAF and broadcast the flight number, aircraft type, position, type of approach in progress, and when over the final approach fix inbound (non-precision approach) or outer marker. A visual approach should include (but not limited to) a position report from 10 miles out, downwind and base leg (if appropriate), final approach and clearing the runway. Continue to broadcast aircraft position and intended actions at regular intervals until block-in. Continue to monitor the appropriate frequency (UNICOM, etc.) for reports from other pilots.

CAUTION

All aircraft in the vicinity of the airport may not be monitoring the CTAF.

When a control tower is not in operation, use all resources to determine traffic. Ramp personnel are an additional source of advisories during tower off-hours.

ATC CLOSEOUT – NON-OPERATING CONTROL TOWER

At airports with non-operating control towers the crew is responsible for closing the IFR flight plan with ATC.

VFR ARRIVAL

If not otherwise possible to obtain a visual or instrument approach clearance to an airport with a non-operating control tower, the flight may cancel IFR and complete a VFR approach provided:

- Reported visibility is equal to or greater than FAR 91.155 but not lower than visibility of 3 SM (see Appx B).
- Reported ceiling of 1000 FT or greater.
- The flight must maintain basic cloud clearance as specified in FAR 91.155 (see Appx B).
- Flight is in direct communication with air/ground communication facility that provides airport traffic advisories.
- Flight is operated within 10 NM of airport or visual reference with landing surface is established and maintained throughout.
- Maintain the minimum altitude specified in FAR 91.119 and 121.657 (see Appx B).

VFR TRAFFIC PATTERN ENTRY – NON-OPERATING CONTROL TOWER

Enter the VFR traffic pattern at an altitude of 1500 FT HAA (unless another altitude is specified). Maintain this altitude until descent is required for landing. Make all turns to the left unless that airport specifies right hand turns for a given runway [FAR 91.126 (b)(1) and 91.127(a)]. Airports requiring right hand traffic patterns for certain runways will list that information in notes on the Jeppesen airport diagram page. Without such a note, fly left hand traffic patterns.

Straight-In Visual Approaches

CAUTION

Aircraft established in the designated rectangular pattern are considered to have right-of-way over aircraft conducting straight-in approaches.

Plan to be established on the extended centerline of the runway in use NO LATER than 4 NM from the runway threshold. If the landing runway is served by an ILS, the aircraft should be aligned with the runway extended centerline by the Outer Marker.

Attachment D

Federal Express Flight Operations Manual (FOM)

Controlled Flight Into Terrain (CFIT)

Pages 2-30 to 2-32

DRUG & ALCOHOL R & R PLAN

The FedEx Drug and Alcohol Rehabilitation and Recertification Plan for Flight Crewmembers (R & R Plan) is contained in Appendix H. The R & R Plan is adopted by FedEx to insure compliance with FAA Special Issuance Medical Certificate requirements (FAR 67.14 and the Federal Air Surgeon's Policy Directive, “Alcoholism and Airline Flight Crewmembers” issued November 10, 1976).

FAA MEDICAL CERTIFICATES

Flight Crewmembers must maintain the following FAA Medical Certificates:

- Captains and MD-11/MD-10 F/Os ... First Class, renewed every 6 mos.
- All other F/Os and S/Os..... Second Class (or higher), renewed every 12 mos.

DUTY OFFICER AUTHORIZATION

When the Duty Officer's authorization is required, that authorization is accomplished verbally. If documentation is desired, the Captain may add a pen and ink notation to the “Remarks” section of the FP/R.

CONTROLLED FLIGHT INTO TERRAIN (CFIT)

Since the beginning of commercial jet operations, Controlled Flight Into Terrain (CFIT) has been the dominant factor for accidents resulting in airplane hull loss and fatalities. CFIT is defined by the Flight Safety Foundation (FSF) as, “An accident in which an aircraft, under the control of the crew, is flown (unintentionally) into terrain, obstacles, or water with no prior awareness on the part of the crew of the impending collision.” While only 4% of an average flight is spent in the approach or landing phase, 41% of CFIT accidents occur in this time period. These accidents are classified as Approach and Landing Accidents (ALA). Another noteworthy statistic is that the CFIT/ALA rate during darkness is 3 times greater than during daylight hours making these risks particularly real for a high percentage of FedEx flights.

FSF studies concluded that AWARENESS is the first step in CFIT/ALA prevention. FedEx is developing proactive strategies to identify and counter CFIT/ALA threats. Since fall of 1999, the Flight Training and CRM Departments have been conducting “stand up” training sessions on this topic during recurrent training. This subject is being addressed to students attending Initial, Upgrade and Transition training as well.

Another way FedEx is enhancing awareness of CFIT/ALA dangers has been the development of quantifiable risk assessment criteria. The FedEx CRM department evaluated as many factors as possible that contribute to these types of accidents and then assigned a weighted "risk value" to each of these factors. Every airport served by FedEx trunk aircraft has now been evaluated based on these criteria and has been assigned a CFIT Risk Assessment Rating based upon its score. Depending on this score, airports may be classified as either High or Moderate risk airports. Some of the criteria used to make these determinations are as follows:

- Airport and ATC capabilities.
- Approach availability.
- Terrain in vicinity of airport.
- Availability of runway and approach lighting.
- Controller's primary language other than English.
- Absence of published departure procedures.

High and Moderate risk airports are now being identified on the Jeppesen 10-10 (salmon) pages. Efforts are also underway to present this information on the FP/R remarks section, the Engine Out Departure Procedures pages (Jeppesen 10-12 "green" pages) and on the APLC.

An additional awareness weapon in the battle against CFIT is the new CFIT Risk Assessment Tool. It is a Jeppesen sized document printed on yellow card stock with a tab to help locate it quickly. It should be placed in a convenient location for quick access such as in your trip book or FOM. It has been developed as a way for crewmembers to make their own evaluations of an airport's risk before departure or enroute as conditions change.

Side one of the Risk Assessment Tool features the Risk Matrix. This offers crewmembers the opportunity to apply specific and objective criteria directly pertinent to the flight. By evaluating each potential risk factor and adding the associated numerical values, the risk for a particular flight can be determined. For example, a combination of deferred aircraft equipment, out of service ground equipment, weather, and crew experience could turn a normally "low risk" airport into a HIGH-risk flight. Side two of the Risk Assessment Tool lists airports that have been identified as being high or moderate CFIT/ALA risks based on the criteria stated above.

Virtually all major airlines operate into airports that can be considered "high" or "moderate" risk for CFIT/ALA. The Risk Assessment Tool is intended to heighten crewmember's awareness of potential CFIT/ALA

risks based on the belief that awareness is the first line of defense in dealing with CFIT/ALA situations.

CREW RESOURCE MANAGEMENT (CRM)

Crew Resource Management is an integral part of all flight operations at FedEx and is a significant contributor to a high level of flight safety. All crewmembers are expected to use these skills as part of the cockpit crew as well as with other personnel with whom they interact in the course of flight operations.

The following skills, when executed together, result in an effective use of resources by all members of the crew.

TEAM FORMATION & MANAGEMENT

All crewmembers have a responsibility to establish an effective team and must do their part to ensure that it is established. The captain has full control and authority, without limitation, in operating the aircraft, and over other crewmembers and their duties during flight [FAR 121.537(d)]. As the team leader, the captain shall exercise this authority in a manner that encourages participation of all crewmembers. The captain is expected to set the proper tone for the flight. Also, each crewmember must:

- Explicitly ask for and offer inputs and feedback.
- Assure that the captain's authority and crew participation are balanced.
- Ask questions to encourage open and interactive communication.
- Manage workload assignments.
- Ensure continuous cockpit discipline, attention to task, and adherence to SOP.
- Demonstrate through personal example what behavior is expected of others.

In addition, the captain will ensure that all assigned crewmembers, including the RFO (if applicable), remain aware of any significant information on the FP/R, weather, NOTAMS, and any deferred or maintenance items affecting the flight.

Attachment E

Federal Express Flight Operations Manual (FOM)

Crew Resource Management (CRM)

Pages 2-32 to 2-35

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- Manage workload assignments.
- Ensure continuous cockpit discipline, attention to task, and adherence to SOP.
- Demonstrate through personal example what behavior is expected of others.

In addition, the captain will ensure that all assigned crewmembers, including the RFO (if applicable), remain aware of any significant information on the FP/R, weather, NOTAMS, and any deferred or maintenance items affecting the flight.

CREW COMMUNICATION

The degree to which the free and open exchange of information occurs on the flight deck is a function of the team-building efforts used during initial pre-flight activities. When the lines of communication remain open throughout the flight, differences in expectations are more likely to be properly addressed. Accordingly, all crewmembers are expected to communicate, manage conflict, be assertive, and debrief when appropriate, as these are among the primary skills which ensure effective flight crew coordination.

- **Briefings**
  Briefings will normally take place in conjunction with the TEAM FORMATION & MANAGEMENT phase of flight preparation. Required briefing items include unusual and/or non-standard events particular to the flight and are in addition to those items delineated in TEAM FORMATION & MANAGEMENT.
- **Assertion**
  Each crewmember must clearly, and in a timely manner, communicate any significant operational development to the rest of the flight crew. This communication shall be respectful and specific as to the nature of the problem, but with appropriate persistence until there is a clear resolution.
- **Conflict Management**
  If a crewmember becomes aware of a significant operational conflict, which causes concern, he must inform the captain. This does not imply there is more than one pilot-in-command, but requires crewmembers to communicate factors which may affect the captain's decisions. Each crewmember is responsible to effectively manage conflicts and is expected to make every attempt to resolve conflicts prior to contacting Flight Management.
- **Debriefings**
  Debriefings shall be conducted after every flight during which a significant operational deviation, event, or conflict has occurred. Deviations from standard operating procedures and practices should be thoroughly reviewed and discussed. The following DEBRIEFING FORMAT (as outlined in the CRM ToolKit, FOM, Figure 2-1) should be used:
  1. What happened during the flight?
  2. What did you think about what happened?
  3. What should we do differently next time?
  4. Conduct a recap of “What went well/what could be improved.”

The debrief should emphasize what happened and what might be done differently in the future - not who was right or wrong. It should include both what was done well and any areas of improvement relating to the flight. In addition, this performance feedback should be offered objectively and accepted non-defensively. The crew debrief should be conducted by the captain, but may be initiated by any crewmember. Debriefs should be conducted in such a way as to encourage participation, feedback and learning, and to resolve any existing conflict.

SITUATIONAL AWARENESS

Safety of flight demands that all crewmembers maintain a constant, high level of Situational Awareness. To maintain a high level of awareness, the captain involves his crew in thorough team planning, conducts pre-task briefings, communicates effectively, and allocates workloads as appropriate.

All crewmembers must be alert for warning signs that Situational Awareness is inadequate or at risk. If these warning signs are present, they must be communicated immediately so that corrective action may be taken.

DECISION MAKING

The best decisions and operations occur when a high level of team management, communications, situational awareness, and standardization exist.

While final authority for all decisions rests with the captain, when time permits during significant operational circumstances, all crewmembers should be actively involved in the decision-making process. The captain should:

- Ensure the aircraft is under positive control at all times.
- Solicit ideas, opinions and recommendations prior to announcing his decision. By asking for input prior to offering his own opinions, the captain will not bias the information provided by other crewmembers.
- Clearly state the decision and thoroughly brief the gameplan.
- Ensure the decision and gameplan are acknowledged and understood by all crewmembers.

Consequently, every crewmember should be able to answer the following questions regarding the decision (as outlined in the CRM ToolKit, FOM, Figure 2-1):

- 1. What's happening?
- 2. What am I going to do?
- 3. How will I do it?
- 4. Who does what?

Any doubts, confusion, or changes must be addressed and resolved.

CRM AND AUTOMATION

Glass cockpit/two-pilot technology requires increased crew discipline to prioritize duties, effectively manage workloads, and inhibit complacency. Effective communication skills, especially those used in cross-checking, verifying inputs, and reviewing flight status are necessary prior to the transition to a new crew position, but are particularly important in two-pilot, automated aircraft. All CRM skills must be used to safely and effectively operate these type aircraft. To be able to realize the full benefits of automation, crewmembers must be aware of warning flags that indicate a misinterpretation of, or over-reliance on automation. To maintain Situational Awareness, crewmembers must:

- Ensure that PF/PNF duties and responsibilities are clearly briefed and understood by all.
- Maintain constant “mode awareness” for all phases of flight.
- Crosscheck and verify FMS inputs for accuracy.

CRM TOOLKIT

The ToolKit outlines CRM techniques that shall be used by all flight operations personnel during flight training, line checks, crew debriefs, and during normal flight operations. Crewmembers should periodically review the ToolKit (see next page) to stay familiar with these techniques.

Attachment F

Federal Express Flight Operations Manual (FOM)

CRM Toolkit

Pages 2-35 to 2-37

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CRM ToolKit

http://pilot.fedex.com

Effective Communications

- **Use standard terminology**
- **Be clear** - avoid ambiguous terms
- **Be specific** - avoid the "hint & hope"
- **Be concise** - say only enough to convey the message
- **Be timely** - say it now, if it needs saying
- **Ask for clarification** - be absolutely sure
- **Acknowledge all communication** - close the loop

Requesting Feedback

- **Describe what happened from your point of view to start a discussion:**
  - "Hey Captain, on this flight I noticed the aircraft ..."
- **Ask for reaction/perceptions:**
  - "How is this supposed to be flown?"
- **Ask, "What if anything, could be done to make that happen?**

Crew Communications Process

CrossCheck / Challenge

- **Monitor & Relay information:**
  "We're a dot low..."
- **Express Concern**
  "I'm concerned" / "I'm uncomfortable"
- **Assertion Statement:**

5 Step Assertion Model

Get someone's attention
Express concern, make an "I" statement
Clearly state the problem
Propose a solution
Get a decision

- **Emergency Statement:**
  "Climb now!!"

Conflict Management

- **Ask 3 questions**
  - What do I expect?
  - What do others expect?
  - Why do I expect what I expect?
- **Make 3 statements**
  - Make an "I" statement of concern
  - Clearly state the problem
  - Propose a solution
- **Do 3 things**
  - Stop talking and listen
  - Abandon your idea if the other is better
  - Be assertive if required

Debriefing

Ask the following questions:

- "What happened during the flight?"
- "What did you think about what happened?"
- "What should we do differently next time?"

Conduct a recap:

	Well	*Improve*
S/O		
F/O		
Capt		

Team Formation & Management

- **Explicitly request Crosscheck & Monitoring**
- **Ask a series of questions to create a pattern of response** - Avoid "Yes/No" questions
- **Provide updates as needed**
- **Acknowlege every communication**
- **Use interpersonal skills** - Eye contact & first names

Decision Making: FLY PAST ABC

(Normally use when event criticality & available time allow)

Fly- Designate aircraft control - Who's flying?
P ossible Options - Build a picture of the situation
A cquire Data - Use internal and external resources
S ummarize Options - Recap options, "Pros / Cons"
T ake Recommendations - Junior position first!
A nnounce the decision
B rief the gameplan
C heck the Shared Mental Model

Shared Mental Model

- **What's happening?**
  - Do I have an accurate picture of the situation?
- **What am I going to do?**
  - What procedures and sequence will I follow?
- **How will I do it?**
- **Who does what?**

Situational Awareness

S.A. Phase 1 – Ensure Flight Path – Climb or Level Off

Maintain S.A. Through Workload Management

- **Conduct effective Team Formation**
- **Project ahead -** Make & brief the plan
- **Pre-brief who does what in high workload situations**
- **Rotate attention -** People, Plane, Path
- **Create "reminders" of interrupted tasks**

Recognize Red Flag(s) – See it, Say it, Fix it!!

- **Ambiguity/Confusion** - 2 sources of information conflict, causing doubt
- **Preoccupation/Nobody Flying the Aircraft** - Fixation on one task to the exclusion of A/C flight path monitoring/control - "Automation Fixation"
- **Not Communicating** - Not talking / Not listening
- **Rushing** - Executing procedures/flows at a faster than normal pace
- **Interrupted Habit/Checklist** - Unplanned break in habit pattern/checklist
- **Violating SOP/Mins** - Exceeding established limits/procedures/minimums
- **Failure to Meet Targets** - e.g. fuel burn, stabilized approach
- **Not Addressing Discrepancies** - confusion, doubts, warnings
- **Fatigue** - Seeing the effects of fatigue in yourself or others
- **Feeling Stressed**

Attachment G

Federal Express Flight Operations Manual (FOM)

Stabilized Approach Corridor

Page 6-13

STABILIZED APPROACH CORRIDOR

A stabilized approach is essential for the safe operation of transport category aircraft and is mandatory for all FedEx line operations. The stabilized approach corridor begins at **500 FT** AGL for those aircraft receiving a clearance for a visual approach and at **1000 FT** AGL for those aircraft receiving a clearance for an instrument approach.

The stabilized approach is defined by the following requirements:

- The aircraft must have landing gear down and locked; the flaps/slats must be in the final landing configuration.
- The engines must be spooled-up and steady at the proper approach setting.
- The proper descent angle and rate of descent must be established and maintained. All available landing aids (ILS, VASI, PAPI, etc.) must be used. Non-precision approaches may require a slightly steeper angle until reaching MDA.
- Airspeed must be stable and within the range of target speed (± 5 KTS of target). Momentary and minor deviations are only tolerated if immediate corrections are made.

The procedure and parameters listed above are not merely targets, THEY ARE MANDATORY CONDITIONS AND LIMITS. ANY DEVIATION OCCURRING AT OR BEYOND THE BEGINNING OF THE STABILIZED APPROACH CORRIDOR REQUIRES A MANDATORY GO-AROUND.

GO-AROUND PHILOSOPHY

The decision to execute a go-around is both prudent and encouraged anytime the outcome of an approach or landing becomes uncertain. FedEx considers the use of the go-around under such conditions as an indication of good judgement and cockpit discipline on the part of the flightcrew.

Attachment H

Jeppesen Chart

TLH

10-10 and 10-10A

FedEx TLH

21 DEC 01 (10-10)

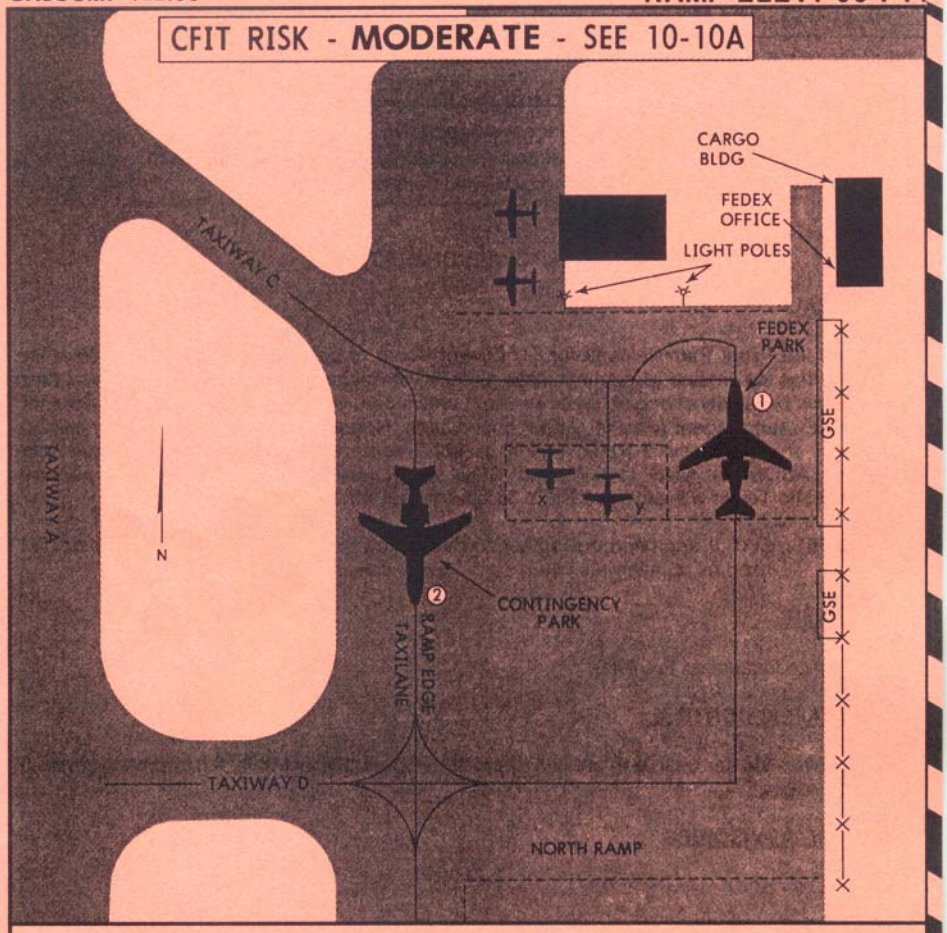
TALLAHASSEE, FLA

TALLAHASSE REGI

FEDEX: 131.925
UNICOM: 122.95

RAMP ELEV: 65 FT.

CFIT RISK - **MODERATE** - SEE 10-10A



FEDEX PARK:

INBOUND:

1. **CAUTION JET BLAST:** Light aircraft parked south of ramp.
2. Gate 1- 727 power in via Taxiway D.
3. Gate 2- 727 power in via Taxiway C.

Coordinates: **N 30-24.1; W 084-21.3**

OUTBOUND:

1. **CAUTION JET BLAST:** Light aircraft parked south of ramp.
2. Gate 1- 727 power out via Taxiway C.
3. Gate 2- 727 power out via Taxiway D.

CONTINGENCY: As assigned by ramp.
FEDEX OFFICE: 800-997-8547
FBO: Flightline; 850-574-4444; monitors UNICOM.
SPECIAL PROCEDURES: Non-Tower Operations; see TLH 10-10A.
REMARKS: 1. **CAUTION:** Light poles three feet from north edge of ramp. Taxi on guidelines provides at least 20 ft. wingtip clearance from poles.
2. Consult Flight Plan/Release for Tower hours of operation.
3. Tallahassee Regional Airport is 4 NM S.W. of Tallahassee.

Primary Review Authority: Flight Safety: (901) 224-5600/ flightsafety@emc.fedex.com

CHANGES: See other side

TALLAHASSEE, FLA
TALLAHASSEE REGL

CFIT RISK - MODERATE

Local ATC and radar coverage unavailable at certain times.
ILS not installed in all directions, potential non-precision approach.
Airport has no published departure procedure.

NON-TOWER OPERATIONS

GENERAL

Consult the Flight Plan/Release for TLH tower hours of operation. The National Weather Service has no means to communicate directly with airborne crews. During low weather conditions or rapidly changing weather, flight crews can, on their in-range call, request that the FedEx ramp agent relay the latest observation. Normally, Tallahassee weather will be available from Gainesville Radio (122.4 or 122.2 approaching Tallahassee), Jacksonville Center, ASOS on ATIS (119.45), or GOC while enroute to Tallahassee. In general Tallahassee Tower will leave ILS RWY 36 operational when they close at night.

NOTES: CAT II approach not authorized when the Tower is closed. TLH may not be used as an alternate when the Tower is closed.

WEATHER

NWS office located on the field.

AIR TRAFFIC CONTROL

Jacksonville Center unable to provide approach vectors. Expect to fly full approach if visual is not available.

TRAFFIC ADVISORIES

CTAF 118.7.

RUNWAY LIGHTING

The approach lights for RWY 18/36 and 9/27 are pilot controlled on CTAF 118.7. See Jeppesen Introduction Tab - chart glossary - pilot controlled lighting.

EMERGENCY

Contact FedEx ramp on Company frequency with the nature of your problem, location, and intentions. They will notify emergency personnel. The FedEx ramp radio will be continuously manned from the in-range call until block-in, and block-out until the off report is made.

CANCELLATION/CLEARANCE

Flight plans can be closed out, and clearances requested from Jacksonville Center (135.32) or Gainesville FSS (122.4) while on the ground at Tallahassee during non-tower operations. [Attempt Jacksonville Center first.]

Attachment I

B727 Company Flight Manual (CFM)

Before Landing Checklist

Pages 3-11-0-1 and 3-0-0-2

LEGEND

There are symbols and abbreviations used throughout the checklist. Their meanings are indicated below.

C	Captain
F	First Officer
S	Second Officer
PF	Pilot Flying — Pilot controlling the airplane flight path, either manually or with the autopilot.
PNF	Pilot Not Flying — Pilot who is assisting the PF but not controlling the airplane flight path, either manually or with the autopilot.
All	All crewmembers (and ACMs, if functioning as a part of the crew).
As Required	There may be more than one appropriate configuration varying with condition.

Normal Checklist Symbols

CHECKLIST FLOWS

Checklist flows are to be accomplished by memory after the Captain or Pilot Flying calls for the appropriate checklist and prior to reading of the challenge and response items. The checklist flow consists of the physical positioning or activation of the switch or control in preparation for the challenge and response. They provide the more efficient sequence in which to accomplish the checklist items.

NORMAL CHECKLIST USAGE

Checklists will be called for by the Captain or PF as applicable. When completed, a checklist will be announced as "_____CHECKLIST COMPLETE." Interrupted checklists shall be reviewed in their entirety and resumed at the point of interruption. The crewmember reading the checklist is responsible for verifying that the challenged items are accomplished. Items which cannot be observed by the crewmember reading the checklist will be responded to by the crewmember responsible for that item. When performing a checklist item for which the listed response is "AS REQUIRED," the configuration in which the checklist item is actually placed will be announced as below.

Autobrakes PF Min

When a challenge concerns equipment not installed, or inoperative on that particular aircraft, the crewmember normally responsible for that item shall respond "NOT INSTALLED", or "INOPERATIVE".

Checklists in a table with a grey background contain mandatory checklist items for Tow-Ins. See CFM or QRH chapter 2-16-2 for expanded delayed start procedures.

CHAPTER 3-11-0

BEFORE LANDING

AMPLIFIED BEFORE LANDING CHECKLIST

(Gear Extension)

(Second Officer Reads)

The pilot flying will call for the Before Landing Checklist in combination with commanding the landing gear down, i.e. “Landing gear down, before landing checklist.”

Landing Gear PNF **Down, In, 3 Green**
S **Checked**

- Check LANDING GEAR lever positioned DOWN and IN, and the 3 green landing gear down and locked indicator lights illuminated.
- The Second Officer's check is a visual verification of 3 green down and locked lights and no red lights.

Autobrakes PNF **As Req/Not installed**

If using autobrakes, place AUTOBRAKE switch to desired position. Check that switch holds in selected position, and that AUTOBRAKE DISARM light is extinguished. Select MIN/MED for long dry runways or MED/MAX for wet, slippery and/or short runways.

Auto Spoilers PNF **As Req/Not installed**

Arm auto spoilers only after speedbrakes are no longer required for maneuvering. If speedbrakes are used after auto spoilers have been armed, auto spoilers will have to be re-armed.

Flight and Navigation Instruments PNF **Cross-Checked, No Flags**

PNF will ensure that both airspeed indicators and altimeters indicate the same values and identify any instrument flags in view.

Flaps PNF **___,___, Green Light**

Check inboard and outboard flaps at landing flap position and green LE FLAPS light illuminated.

GPS Alerts CF **Inhibit/If installed**

Push the Alert Inhibit switch on both Remote GPS Annunciator Panels. Observe the light blue INHBT lights illuminated.

Landing Clearance PNF **Clear to Land**

▶ **Fuel Panel** S **Set**

For landing, establish tank-to-engine configuration with all boost pumps ON.

▶ **Hydraulic and Brake System** S **Checked**

Hydraulic pressure and quantity indicators normal. Brake pressure indicators normal.

▶ **Antiskid** S **On, Lights Out**

▶ **Landing Lights** PNF **On**

Use inboard and outboard landing lights, runway turn off lights, and taxi lights for runway illumination during landing. If weather conditions dictate, turning landing lights on may be delayed until PF calls for them.

Attachment J

B727 Company Flight Manual (CFM)

Landing Procedures Summary Table

Page 7-1-9-7

Landing Procedures Summary Table

Pilot Flying	Pilot Not Flying	Second Officer
Command flap extension on the flap/speed schedule in accordance with the landing approach requirements.	Select flaps as directed and reply, "Flaps ___." Monitor flap and leading edge device indicators for correct indication.	Monitor hydraulic systems pressure and quantities and flap and leading edge device indicators for correct indication.
Prior to crossing the FAF, crosscheck all flight and navigation instruments, observe all warning flags retracted and all radios tuned to correct frequencies.	Prior to crossing the FAF, crosscheck all flight and navigation instruments, observe all warning flags retracted and all radios tuned to correct frequencies.	Prior to crossing the FAF, crosscheck all flight and navigation instruments, observe all warning flags retracted and all radios tuned to correct frequencies.
In accordance with the landing approach requirements command "Gear down, before landing checklist."	Position landing gear lever DOWN. Observe lights for proper landing gear extension. If called for by the pilot flying, use windshield wipers to improve visibility.	Check landing gear down and locked, brake pressure, Sys A quantity and pressure and tailskid extended. Read and crosscheck BEFORE LANDING checklist.
Command "Flaps 25"	Select flaps 25° and reply, "Flaps 25°." Monitor extension. Monitor flap and leading edge device indicators for correct indication.	Monitor hydraulic systems pressure and quantities and flap and leading edge device indicators for correct indication.
Command "Flaps 30"	Select flaps 30° and reply, "Flaps 30°." Monitor extension. Monitor flap and leading edge device indicators for correct indication.	Monitor hydraulic systems pressure and quantities and flap and leading edge device indicators for correct indication.
	Landing light switches ON.	Complete BEFORE LANDING checklist. Turn seat either full forward or first notch to the right of full forward. Turn OFF wing anti-ice no lower than 400 feet AGL.

Autobrake Operation

The use of autobrakes is at the Captain's discretion. Autobrakes adds the safety factor of brake application immediately after wheel spin-up after touchdown and should be considered in adverse conditions such as wet, slippery, or short runways or when work load is higher than normal. Because wheel brake application at high speeds increases brake wear, autobrake usage should be considered based on existing conditions.

At main wheel spin up, the autobrakes, if installed, will commence MIN braking. When MED or MAX braking are selected, MIN braking will start at touchdown. The autobrakes will increase to MED or MAX when the nosewheel is on the ground. When the autobrakes are used, there will be a slight tendency for the aircraft nose to pitch down. This may require a small amount of back pressure on the yoke to prevent firm nosewheel contact with the runway.

Selection of autobrakes is accomplished during the Before Landing Checklist. After touchdown, the Captain should allow the aircraft to decelerate to approximately 50 KIAS, then release the autobrakes with brake pedal application. However, at any time the deceleration is not as desired or appears incorrect, the autobrakes should be deactivated by depressing the brake pedals to achieve the desired rate of deceleration.

Attachment K

B727 Company Flight Manual (CFM)

Callouts Approach

Page 7-0-1-4

Callouts Approach

Altitude or Position (feet)	Visual	Nonprecision	Monitored NonPrecision	CAT I (unmonitored)	CAT I/II/III (monitored)
Indicator Movement		PNF - "Localizer alive" PNF - "VOR alive"	C - "Localizer alive" C - "VOR alive"	PNF - "Localizer alive" PNF - "Glideslope alive"	C - "Localizer alive" C - "Glideslope alive"
1000'[1]		PNF - "stable" or "unstable go-around "	C - "stable" or "unstable go around"	PNF - "stable" or "unstable go-around"	C - "stable, Category I/II/III " or "unstable go-around"
500'[1]	PNF - "stable" or "unstable go-around"				
100' above Minimums		PNF - "Approaching Minimums"	C - "Approaching minimums"	PNF - "Approaching Minimums"	C - "Approaching Minimums, going heads up" C - "I have the airplane"
Minimums		PNF -"Minimums"	PNF - "Minimums"	PNF - "Minimums" or PNF - "Minimums, go around"	F - "Minimums" or F - "Minimums, going around" [2]
15 sec or ½ mile prior to VDP		PNF - "Approaching VDP"	PNF - "Approaching VDP" If runway in sight, C - "I have the airplane" [3]		
VDP		PNF - "VDP"[4] If runway in sight, PF - "Leaving MDA"	PNF - "VDP"[3,4] If runway in sight, C - "Leaving MDA"		
Below Minimums		PNF - "____" Altitude in 100' increments referencing TDZE, airspeed referenced to Bug, sink rate	F - "____" Altitude in 100' increments referencing TDZE, airspeed referenced to Bug, sink rate.	*If the aircraft is below minimums and no minimums call was announced, the SO will announce "Below Minimums"*	*If the aircraft is below minimums and no minimums call was announced, the SO will announce "Below Minimums"*
Missed Approach Point		PF - "Missed Approach Going Around"	PF - "Missed Approach Going Around"		
Go-around	A go around must be called out if it is initiated.				
Advisory Callouts	Any deviation listed below requires a callout. • PF/PNF - Visual cues should be called as they appear (as appropriate). • PNF - "Airspeed +/- ____" (deviations in excess of 5 knots below 1000 ft.) • PNF - "Sink rate" (descent in excess of 1000 FPM below 1000 ft.). • PNF - "Glideslope" (deviations in excess of 1/2 dot on raw data). • PNF - "Localizer" (deviations in excess of 1/3 dot on raw data).				

1. Designated crewmember must make the 1000' or 500' callout if the GPWS is inoperative.
2. If the Captain has assumed control of the aircraft and subsequently makes the decision to go-around, the Captain will announce "Going around".
3. Captain will assume control of the aircraft no earlier than "Going Heads Up" and no later than leaving DH.
4. VDP callouts are mandatory when a VDP is published or calculated by the flight crew. In some situations it is not possible to calculate a VDP. In these cases, the callout is not required.