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

March 7, 2005

Group Chairman's Factual Report

OPERATIONAL FACTORS

DCA05MA004

A. ACCIDENT

Operator:	Corporate Airlines, Inc. dba American Connection
Location:	Kirksville, Missouri
Date:	October 19, 2004
Time:	1945 Central Daylight Time[1]
Airplane:	Jetstream 3201, Registration Number: N875JX

B. OPERATIONS GROUP

Captain B. David Tew - Chairman Operational Factors Division (AS-30) National Transportation Safety Board 490 L'Enfant Plaza East, SW Washington, DC 20594-2000	Mr. Harvey E. Haynes - Member Federal Aviation Administration Flight Standards District Office 10801 Pear Tree Lane, Suite 200 St. Ann, Missouri 63074
Captain Chris Hardee* - Member Corporate Airlines 5141 Chippendale Drive Murfreesboro, Tennessee 37129	

* Captain Hardee replaced Captain Charles Brooks as a member of the Operations group on approximately December 8, 2004. Captain Brooks had accepted a position with AirTran Airlines.

[1] All times are Central Daylight Time (CDT) based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate, determined by the Flight Data Recorder (FDR) and Air Traffic Control (ATC) transcripts.

C. SUMMARY

At approximately 1945 central daylight time, October 19, 2004, a Corporate Airlines, Inc. flight operating as American Connections flight 5966, BAE Systems Jetstream 3200, N875JX, operating in accordance with 14 CFR Part 121, crashed while the flight was on approach to the Kirksville Regional Airport (KIRK), Kirksville, Missouri. The flight was conducting a non-precision LOC/DME Runway 36 approach. Eleven of the thirteen passengers and the two flight crewmembers were fatally injured. The two surviving passengers received serious injuries. The airplane was destroyed by impact and post-impact fire. The reported weather was visibility three miles in mist and an overcast ceiling at 300 feet.

D. DETAILS OF THE INVESTIGATION

The Operations group traveled to the accident site on Wednesday, October 20, 2004 where they inspected the accident site and gathered flight paperwork.

On October 21, 2004, the Operations group traveled to St. Louis, Missouri, which was the domicile of the accident pilots. Personnel records were reviewed, including training and personnel records. The group gathered information for the 72-hour history of the accident pilots which will be covered in a special study report by the Human Performance division. Interviews were conducted with two line captains, one check captain, and a first officer (F/O). An examination by the Operations group was made of a sister ship of the accident airplane for familiarization.

The group traveled to Smyrna, Tennessee on the evening of Saturday, October 23, 2004. Smyrna, Tennessee was the corporate and training headquarters for Corporate Airlines. The group gathered and reviewed flight and training manuals. Interviews were conducted with the director of training, a captain who worked in the training department, a check captain, the Federal Aviation Administration (FAA) principal operations inspector (POI) for Corporate Airlines, and the assistant chief pilot of the airline. This field phase of the investigation was concluded on October 24, 2004.

On October 27 and 28, 2004, two phone interviews were conducted with the assistant POI of Corporate Airlines. On November 1, 2004, a telephone interview was conducted with an FAA airspace evaluation program specialist and another interview was conducted with the mother of the accident F/O. On November 3, a telephone interview was conducted with the Fiancée of the accident captain. On December 28, 2004, a telephone interview was conducted with the brother of the accident captain and another interview was conducted with an AirTran captain who knew the accident captain and had recommended him for pilot positions at Corporate Airlines and AirTran Airlines.

1.0 HISTORY OF FLIGHT

The flightcrew was on a regularly scheduled four day sequence that began on Sunday, October 17, 2004. The accident occurred on the last flight of the third day.

On Sunday, October 17, 2004, the accident captain departed his home in Ramsey, New Jersey at about 0800 to commute to St. Louis, Missouri to originate his flight sequence. On Sunday,

October 17, 2004, the accident F/O departed from his home in Cincinnati, Ohio at about 0900 to commute to St. Louis, Missouri to originate his flight sequence. The crew departed Lambert - St. Louis International Airport (STL), St. Louis, Missouri on schedule, at 1445 on the first flight of the first day of the sequence. The accident flightcrew flew three flights on the first day for a total of three hours and three minutes of flight time and were on duty for seven hours and fifty five minutes. They arrived in Quincy Regional - Baldwin Airport (UIN), Quincy, Illinois at 2125 for an overnight.

On Monday, October 18, 2004, they departed UIN at 1415. The flightcrew flew four flights on the second day for a total of three hours and thirty six of flight time and were on duty for six hours and twenty one minutes. They arrived at Southeast Iowa Regional Airport (BRL), Burlington, Iowa at 1945 for an overnight.

The crew had been originally scheduled to arrive in BRL at 1939 and was scheduled to depart the following morning at 0544. The company added 15 minutes of duty time to the arrival time to account for post-flight paperwork and duties. The crew was scheduled to check-in 30 minutes prior to the morning departure time. This meant that the accident crew was originally scheduled for nine hours and 20 minutes free from duty. The flight into BRL arrived 15 minutes late so the crew actually had nine hours and 5 minutes free from duty before beginning the third day of the sequence.

On Tuesday, October 19, 2004, they departed BRL on schedule at 0544 and arrived in STL at 0644. The crew was originally scheduled to fly STL to UIN at 0930 and back to STL, but these flights were cancelled. The crew departed STL at 1236 for a flight to Kirksville Regional Airport (IRK), Kirksville, Missouri and then a flight back to STL arriving at 1453. The crew then departed STL at 1513 for a flight to BRL and a flight back to STL arriving at 1745.

The accident crew had originally been scheduled for eight flights on the third day, but two flights were cancelled. The accident flight was the sixth flight of the day for the crew. At the time the accident occurred, the crew had been on duty for fourteen hours and thirty one minutes and had flown six hours and fourteen minutes of flight time.

The crew departed STL on schedule at 1842 on the accident flight to IRK. The captain was the flying pilot (FP). The flight climbed to and cruised at an altitude of 12,000 feet mean sea level (MSL) enroute to IRK. The Automated Surface Observing System (ASOS) weather reported the weather at 1919 at IRK was: three hundred feet overcast conditions with mist, wind from 040 degrees at five knots, temperature was nine degrees Centigrade (C) with a dew point of nine degrees C.

The crew descended into the IRK area and began a localizer LOC DME[2] approach to runway 36. The airplane contacted trees approximately on the localizer centerline at about 1945 and crashed about a mile short of the runway.

[2] LOC = localizer, DME = distance measuring equipment.

2.0 FLIGHT CREW INFORMATION

Both crew members were current and qualified under Corporate Airlines and FAA requirements.

2.1 Captain Kim William Sasse

Date of birth: [redacted]956
Date of hire with Corporate Airlines, Inc.: March 20, 2001

FAA records of Captain Sasse indicated that:
Private Pilot - Airplane Single Engine Land certificate was issued on June 24, 1987.
Private Pilot - Airplane Multi-Engine Land certificate was issued on July 24, 1987.
Commercial Pilot – Airplane Multi-Engine Land certificate was issued on December 21, 1987.
Commercial Pilot Instrument Airplane certificate was issued on April 27, 1988.
Commercial Pilot – Airplane Single and Multi-Engine Land certificate was issued on July 1, 1991.
Flight Instructor- Airplane Single Airplane certificate was originally issued on September 3, 1991.
Flight Instructor- Airplane Single Airplane - Instruments certificate was originally issued on September 11, 1991.
Air Transport Pilot – Airplane Multi-Engine Land- with BA-3100 rating certificate was issued on August 26, 2003.

From September, 1999 to March 2001, Captain Sasse worked for Caldwell Flight Academy in Fairfield, New Jersey as a flight instructor.

Prior to September, 1999, he worked for several firms in the computer industry in non-aviation positions.

Pilot certificates and ratings held by Captain Sasse at time of the accident:

FLIGHT INSTRUCTOR (issued August 7, 2003)
AIRPLANE SINGLE ENGINE/CFI
INSTRUMENT AIRPLANE/CFI
VALID ONLY WHEN ACCOMPANIED BY PILOT CERTIFICATE

AIRLINE TRANSPORT PILOT (issued August 26, 2003)
AIRPLANE MULTIENGINE LAND
BA-3100*
COMMERCIAL PRIVILEGES
AIRPLANE SINGLE ENGINE LAND
(no limitations)
[* This rating included the BA-3201 airplane.]

Medical Certificate:
First Class (issued June 22, 2004)
Limitations: SHALL HAVE AVAILABLE LENSES FOR NEAR VISION

Training and Proficiency Checks:
Corporate Airlines Initial New Hire training completed on May 3, 2001
Initial Type Rating Jetstream 3201: August 26, 2003
Upgraded to captain on BAE 3201 on September 17, 2003
Last Recurrent training: June 13 and 15, 2004
Last recurrent ground training: July 7, 2004
Corporate Airlines last Proficiency check on BAE 3201 on July 16, 2004
Last Line Check: September 28, 2004

On June 28, 1991, Captain Sasse received a NOTICE OF DISAPPROVAL when he failed a soft field approach and landing on his proficiency check for his COMMERCIAL PILOT Single Engine Land certificate. He was retested on July 1, 1991 and passed.

On June 13, 2004 during a Recurrent training proficiency check, he failed a takeoff with engine power failure after V1 and failed a single engine Instrument Landing System (ILS) approach. These items were retested on June 15, 2004 and were successful.

Flight Times: based on Corporate Airlines employment records

Total pilot flying time	4,234 hours
Total Pilot-In-Command (PIC) time	3,277 hours
Total Jetstream 3201 flying time	2,510 hours
Total Jetstream 3201 PIC time	719 hours
Total flying time last 24 hours	6 hours, 12 minutes
Total flying time last 7 days	15 hours, 46 minutes
Total flying time last 30 days	72 hours,48 minutes
Total flying time last 90 days	191 hours, 36 minutes
Total flying time last 12 months	669 hours, 27 minutes

A review of FAA records found no accident, incident or enforcement actions.

2.2 First Officer Jonathan William Palmer

Date of birth: [redacted] 1974
Date of hire with Corporate Airlines, Inc.: August 15, 2004

FAA records of F/O Palmer indicated that:
Private Pilot - Airplane Single Engine Land certificate was issued on August 24, 1994.
Private Pilot - Airplane Single Engine Land - Instruments certificate was issued on August 3, 1995.

Commercial Pilot – Airplane Single Engine Land - Instruments certificate was issued on May 3, 1996.
Flight Instructor – Airplane Single Engine certificate was issued on July 11, 1996.
Flight Instructor- Airplane Single Engine - Instruments certificate was issued on July 28, 1999.
Commercial Pilot – Airplane Single and Multi-Engine Land - Instruments certificate was issued on December 19, 1999.
Ground Instructor – Instruments certificate was issued on June 26, 2000.

From 1992 to 2000, he was employed by several firms in non-aviation positions.

From September, 1993 to June, 1996, he attended the University of Cincinnati in Batavia, Ohio.

From July, 1996 to August, 2004, F/O Palmer worked for Eastern Cincinnati Aviation in Cincinnati, Ohio as a flight instructor.

From July, 2000 to June 2002, he attended Embry Riddle Aeronautical University in Cincinnati, Ohio.

From February, 2001 to October, 2001, he worked as a F/O on the B-727 for 86 flight hours at Sunworld International Aviation, based in Florence, Kentucky. He was furloughed from Sunworld in October, 2001.

Pilot certificates and ratings held by F/O Palmer at time of accident:

GROUND INSTRUCTOR (ISSUED June 26, 2000)
INSTRUMENT/ GI

FLIGHT INSTRUCTOR (issued June 30, 2004)
AIRPLANE SINGLE ENGINE/ CFI
INSTRUMENT AIRPLANE/ CFI
Limitations: VALID ONLY WHEN ACCOMPANIED BY PILOT CERTIFICATE

COMMERCIAL PILOT (issued September 13, 2004)
AIRPLANE SINGLE ENGINE LAND/ COMMERCIAL PILOT
AIRPLANE MULTIENGINE LAND/COMMERCIAL PILOT
INSTRUMENT AIRPLANE/COMMERCIAL PILOT

Medical Certificate:
First Class (issued February 17, 2004)
Limitations: HOLDER SHALL WEAR CORRECTIVE LENSES

Training and Proficiency Checks:

Corporate Airlines Proficiency check on a BAE 3201: passed on August 12, 2004

F/O Palmer received a NOTICE OF DISAPPROVAL on May 31, 1996 when he failed an oral examination for his FLIGHT INSTRUCTOR AIRPLANE SINGLE ENGINE. He was unsatisfactory on the technical area of flight controls. He was retested on July 11, 1996 and passed.

Flight Times: based on Corporate Airlines employment records

Total pilot flying time	2,856 hours
Total PIC time	2,698 hours
Total second-in-command (SIC) time	192 hours
Total time in Jetstream-3201	106 hours
Total flying time last 24 hours	6 hours, 12 minutes
Total flying time last 7 days	15 hours, 46 minutes
Total flying time last 30 days	72 hours, 20 minutes
Total flying time last 90 days	104 hours, 44 minutes

A review of FAA records found no accident, incident or enforcement actions.

3.0 WEIGHT AND BALANCE

The following information was entered on the Aircraft Load Manifest form that was found at the accident site. This form contained the following information[3]:

	Weight
Basic Operating Weight	10,519 lbs.
Passenger Weight	2,574 lbs.
Aft Cargo Weight (bags & freight)	310 lbs.
POD (bags & freight)	105 lbs.
Zero Fuel Weight	13,508 lbs.
Fuel	2,300 lbs.
Ramp Weight	15,808 lbs.
Taxi Fuel Burn	60 lbs.
Takeoff Weight	15,748 lbs.
Fuel Burn (to IRK)	563 lbs.
Landing Weight	15,185 lbs.
Maximum Takeoff Weight Allowed	16,172 lbs.
Maximum Landing Weight Allowed	15,609 lbs.

The Operations group used the Corporate Airlines center of gravity (CG) calculator to determine that the takeoff center of gravity (CG) was within the approved limits of the airplane.

[3] See attachment 2

4.0 AERODROME INFORMATION

At the time of the accident, Kirksville Regional Airport elevation was 966 feet above mean sea level (MSL), and was located in Kirksville, Missouri. The airport had one hard surface runway and one turf runway. Both runways were 100 feet wide. Runway 18/36 was hard surfaced and was 6,005 feet long, runway 9/27 was a turf runway and was 1,393 feet long.

Runway 18 had medium intensity runway lights (MIRL) and runway end identification lights (REIL). Runway 36 had medium intensity runway lights (MIRL) and a medium intensity approach lighting system (MALS). Runway 18 and runway 36 each had a visual approach slope indicator (VASI-L) located on the left side of the runway.

5.0 STANDARD CALLOUTS

During an approach, effective crew coordination between the pilot flying and the pilot not flying requires that the pilots interact and communicate while performing their respective roles, flying and monitoring. Both crewmembers should maintain situational awareness during the approach and the normal progress along the approach profile should be confirmed by standardized callouts. A deviation from these standardized callouts should alert the crewmembers that they might be deviating from the normal approach profile or otherwise approaching a possibly unsafe condition.

5.1 PILOT CALLOUTS

The Corporate Airlines J3201 Flight Manual, Section 7 Approach and Landing Section, page 6 stated in part:

> *To insure a complete and common understanding between both crewmembers regarding the present location and status of the aircraft during an approach, the standard callouts listed below will be used:*
>
> ***Altitude Awareness***
> *100" above DH/MDA*
> *"One Hundred feet above minimums" – NFP*
>
> *At DH/MDA*
> *"Minimums" – NFP*
>
> ***Approach Callouts***
> *Intercepting inbound course*
> *"Localizer/Course alive – no flags" – NFP*
> *"Runway in Sight" – NFP*
> *"Runway in Sight (state relative position, i.e. 12 O'clock)" – NFP*

The Corporate Airlines altitude awareness procedures required the non-flying pilot (NFP) to make a callout of when the airplane was one hundred feet above the minimum descent altitude (MDA) and when the airplane arrived at the MDA when performing a localizer approach (LOC).

The Corporate Airlines J3201 Aircraft Manual, Normals Section Page 57[4] stated that if the missed approach point was reached and visual contact was attained that would allow the descent to continue to 100 feet above TDZE, the NFP would call "APPROACH LIGHTS IN SIGHT CONTINUE". The NFP pilot was to continue making appropriate altitude callouts. When the NFP called "RUNWAY IN SIGHT", the FP was to transition to visual cues outside the cockpit an, and upon seeing the runway, state "GOING VISUAL, LEAVING MINIMUMS, FLAPS 35°".

The Corporate Airlines approach callout procedures required the NFP pilot to state when the localizer indicator became active on the flight instruments. The approach procedures required the NFP to state when he had the runway visually insight and what direction it was located.

5.2 AIRPLANE CALLOUTS

The Corporate Airlines J32 Systems Manual, Instruments Section, page 9-37[5] stated that to increase situational awareness during final approach, as the airplane descended, the airplane ground proximity warning system (GPWS) made the callouts "FIVE HUNDRED" and "TWO HUNDRED". The callouts referred to the airplane's altitude above ground level (AGL). The 500 foot callout occurred once per approach, and only occurred when a precision approach was not being utilized, or if the airplane was well below a glideslope being flown. The 200 foot callout occurred once per approach and was annunciated on all approaches.

6.0 NON-PRECISION APPROACH

The accident crew was performing a LOC DME approach to the IRK runway 36. This was an approach using the localizer (LOC) guidance aided by distance measuring equipment (DME) which indicated the distance to IRK runway 36. This approach was called a non-precision approach because there was no electronic vertical guidance provided for the approach. The DME was collocated with the localizer transmitter on the airport. The LOC DME approach at IRK required that the airplane pass over the final approach fix (FAF), an outer marker (OM) that was located at 5.2 DME. The airplane could then descend to minimum descent altitude (MDA) of 1,320 feet MSL or 356 feet above the runway touchdown zone. If the flight crew saw the "runway environment" (described in section 6.3) they could continue their descent to 100 feet AGL until they could see the landing runway. If they did not acquire visual contact with the runway by the time they reached the missed approach point of 1.1 DME (approximately) over the runway threshold, they were required to execute a missed approach.

ATC Radar and flight data recorder data indicate that the airplane began descent after passing the FAF at an average descent rate of about 1,200 feet per minute, and continued its descent through the MDA and subsequent 100 foot altitude until it crashed approximately 1.2 miles from the runway or at approximately 2.3 DME.

[4] See attachment 4
[5] See attachment 3

6.1 DESCENT PROCEDURES

6.1.1 CORPORATE AIRLINES GUIDANCE

The Corporate Airlines J3201 Aircraft Manual, Normals Section, page 57[6] indicated that when performing a "Normal Non Precision Approach" the crew should select approach flaps (20 degrees) and stabilize the airplane speed at 130 knots indicated airspeed (KIAS) prior to reaching the final approach fix (FAF). The manual stated that "at the FAF, start timing and reduce power to maintain the briefed approach airspeed and approximately 1,000 fpm [feet per minute] rate of descent (as necessary), until reaching MDA".

Post-accident interviews indicated that Corporate Airlines pilots were trained to use the following procedures for a non-precision approach: (1)select approach flaps (20 degrees and extend the gear prior to the final approach fix (2) set about 40 % of engine torque to maintain approach speed (3) at the final approach fix, reduce engine torque setting to about 20% which would give a descent rate of about 1,000 fpm while maintaining the approach speed.

The Corporate Airlines J3201 Aircraft Manual, Normals Section, Pages 40 & 41[7] stated in part:

> *The normal glide path is based on an ILS [instrument landing system] glide slope angle of 3°.*
> *A 3° glide path can be approximated by maintaining 300 ' [feet] of altitude for each mile from the runway. For example, when crossing a fix five miles from touchdown, the aircraft should be at (or slightly above) 1500' above the runway at that point. Any fix (e.g., DME or established landmark) that is accurately defined can be used in applying this rule. The rate of descent on a 3° glide path is a function of ground speed and will be most often between 650' and 800' per minute. If the ground speed is known, or can be accurately estimated, the approximate rate of descent on a 3° glide path can be calculated by the following rule of thumb: One-half the ground speed (knots) times ten will give a close approximation of the descent rate (fpm)[feet per minute] required to maintain the desired (3°) glide path. For example, ground speed is 140 knots: 140 ÷ 2 X 10 = 700 fpm required to maintain approximate 3° glide path.*

Post-accident interviews indicated that the procedure to use 300 feet per each mile as an indicator for desired altitude was not stressed during training. Interviews indicated pilots were aware the procedure was in the aircraft manual.

The Jeppesen KIRKSVILLE, MO, LOC DME RWY 36 approach plate[8], which was used by Corporate Airlines, contained guidance to perform a 3.41º descent angle. At a speed of 130 knots indicated airspeed (KIAS) a descent rate of about 784 fpm would give an approximate 3.41º descent angle.

6.1.2 STABILIZED APPROACH/ CONSTANT-RATE/ CONSTANT ANGLE GUIDANCE

[6] See attachment 4
[7] See attachment 5
[8] See Attachment 6

The Corporate Airlines J3201 Flight Manual, Section 7 Approach and Landing, pages 8 & 9[9] stated in part:

Stabilized Approach Criteria

A. When any approach fails to meet the following stabilized approach criteria during IMC [instrument meteorological conditions], an immediate missed approach (or go around, as appropriate) is mandatory.

C. Phase 1

1) 2,000 Feet AFL to 1,000 AFL.

2) Maximum Descent Rate: 2,000 FPM.

D. Phase 2

1) 1,000 Feet to 300 Feet AFL.

2) Maximum Descent Rate: 1,200 FPM

E. Phase 3

1) 300 Feet to 50 Feet AFL

2) Maximum Descent Rate: 900 FPM

The FAA aeronautical handbook, FAA-H-8083-3A Airplane Flying Handbook, Chapter 8 - Approaches and Landings, NORMAL APPROACH AND LANDING, STABILIZED APPROACH CONCEPT stated in part:

STABILIZED APPROACH CONCEPT

A stabilized approach is one in which the pilot establishes and maintains a constant angle glidepath towards a predetermined point on the landing runway. It is based on the pilot's judgment of certain visual clues, and depends on the maintenance of a constant final descent airspeed and configuration.

The Federal Aviation Administration (FAA) recommends a stabilized approach concept. To the greatest extent practical, on final approach and within 500 feet AGL, the airplane should be on speed, in trim, configured for landing, tracking the extended centerline of the runway, and established in a constant angle of descent towards an aim point in the touchdown zone.

The FAA aeronautical handbook, FAA-H-8261-1 INSTRUMENT PROCEDURES HANDBOOK, CHAPTER 5 - APPROACHES, APPROACH PLANNING, OPERATIONAL CONSIDERATIONS, VERTICAL NAVIGATION stated in part:

A constant-rate descent has many safety advantages over the traditional method of descent on nonprecision approaches. A stabilized approach can be maintained from the FAF to the landing when a constant-rate descent is used.

In instrument meteorological conditions (IMC), you must continuously evaluate instrument information throughout an approach to properly maneuver the aircraft (or monitor autopilot performance) and to decide on the proper course of action at the decision point (DA, DH, or MAP). Significant speed and configuration changes during

[9] See attachment 7

an approach can seriously degrade situational awareness and complicate the decision of the proper action to take at the decision point. You must begin to form a decision concerning the probable success of an approach before reaching the decision point. Your decision-making process requires you to be able to determine displacements from the course or glidepath centerline, to mentally project the aircraft's three-dimensional flight path by referring to flight instruments, and then apply control inputs as necessary to achieve and maintain the desired approach path. This process is simplified by maintaining a constant approach speed, descent rate, vertical flight path, and configuration during the final stages of an approach. This is referred to as the stabilized approach concept.

The FAA Advisory Circular AC-120-71A STANDARD OPERATING PROCEDURES FOR FLIGHTDECK CREWMEMBERS dated 2/27/03 stated in part:

This AC is designed to provide advice and recommendations about the development, implementation, and updating of SOPs. Appendix 1, Standard Operating Procedures Template, provides many important topics that should be addressed in SOPs. Stabilized Approach, characterized by a constant-angle, constant-rate of descent ending near the touchdown point where the landing maneuver begins, is among the SOPs specifically identified in this AC and is described in Appendix 2, Stabilized Approach: Concepts and Terms. These and the other appendices represent a baseline and a starting point. Start-up certificate holders and existing certificate holders should refer to the Template in Appendix 1, to Stabilized Approach in Appendix 2, and to the other appendices in developing comprehensive SOPs for use in training programs and in manuals used by their flight deck crewmembers.

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Appendix 2
*A **stabilized approach** is one of the key features of safe approaches and landings in air carrier operations, especially those involving transport category airplanes.*
*A stabilized approach is characterized by a **constant-angle, constant-rate of descent** approach profile ending near the touchdown point, where the landing maneuver begins.*
A stabilized approach is the safest profile in all but special cases, in which another profile may be required by unusual conditions.
*All appropriate **briefings and checklists** should be accomplished before 1000' height*

above touchdown (HAT) in instrument meteorological conditions (IMC), and before 500' HAT in visual meteorological conditions (VMC).
*Flight should be **stabilized by 1000'** HAT in IMC, and by 500' HAT in VMC.*
*An approach is stabilized when all of the following **criteria** are maintained from 1000 HAT[height above terrain] (or 500 HAT in VMC) to landing in the touchdown zone:*

The airplane is on the correct track.

The airplane is in the proper landing configuration.

After glide path intercept, or after the final approach fix (FAF), or after the derived fly-off point (per Jeppesen) the pilot flying requires no more than normal bracketing corrections to maintain the correct track and desired profile (3° descent angle, nominal) to landing within the touchdown zone. Level-off below 1000' HAT is not recommended.

The airplane speed is within the acceptable range specified in the approved operating manual used by the pilot.

The rate of descent is no greater than 1000 feet per minute (fpm).

•If an expected rate of descent greater than 1000 fpm is planned, a special approach briefing should be performed.

•If an unexpected, sustained rate of descent greater than 1000 fpm is encountered during the approach, a missed approach should be performed. A second approach may be attempted after a special approach briefing, if conditions permit.

Power setting is appropriate for the landing configuration selected, and is within the permissible power range for approach specified in the approved operating manual used by the pilot.

***When no vertical guidance is provided:** On approaches for which no vertical guidance is provided, the flightcrew should plan, execute, and monitor the approach with special care, taking into account traffic and wind conditions. To assure vertical clearance and situation awareness, the pilot not flying should announce crossing altitudes as published fixes and other points selected by the flightcrew are passed. The pilot flying should promptly adjust descent angle as appropriate. A constant-angle, constant-rate descent profile ending at the touchdown point is the safest profile in all but special cases.*

Visual contact. Upon establishing visual contact with the runway or appropriate runway lights or markings, the pilot should be able to continue to a safe landing using normal bracketing corrections, or, if unable, should perform a missed approach.
No visual contact. The operator may develop procedures involving an approved, standard MDA buffer altitude or other approved procedures to assure that descent below MDA does not occur during the missed approach. If no visual contact is established approaching MDA or an approved MDA buffer altitude, or if the missed approach point is reached, the pilot should perform the published missed approach procedure. Below 1000' HAT, leveling off at MDA (or at some height above MDA) is not recommended, and a missed approach should be performed.

Corporate Airlines did not have guidance for the use of a constant-angle, constant-rate of descent profile and pilots were not trained to use a constant-angle, constant-rate of descent profile.

6.2 LEVEL-OFF at MDA

The FAA Advisory Circular AC-120-71A STANDARD OPERATING PROCEDURES FOR FLIGHTDECK CREWMEMBERS dated 2/27/03, Appendix 19 EXAMPLES stated in part:

> ***• SOPs to support improved monitoring during vertical segments of flight***
> *During the last 1,000 feet of altitude change both pilots should focus on the relevant flight instruments to ensure that the aircraft levels at the proper altitude. (When VMC one pilot should include scanning outside for traffic; however, at least one pilot should focus on ensuring that the aircraft levels at the proper altitude.)*
> *Rational: A study on crew monitoring conducted by NASA Aviation Safety Reporting System (ASRS) revealed that three-quarters of the monitoring errors in that study occurred while the aircraft was in a vertical phase of flight, i.e., climbing, descending or approach.*
>
> *Many altitude deviations occur because pilots are not properly monitoring the level off.*

6.3 DESCENT BELOW MDA

Code of Federal Regulations (CFR) part 91.175 states in part:

> *Takeoff and landing under IFR.*
> *(c) Operation below DH or MDA. Where a DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DH unless -*
> *(1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;*
> *(2) The flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and*
> *(3) Except for a Category II or Category III approach where any necessary visual reference requirements are specified by the Administrator, at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:*
> *(i) The approach light system, except that the pilot may not descend below 100 feet above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.*
> *(ii) The threshold.*
> *(iii) The threshold markings.*
> *(iv) The threshold lights.*
> *(v) The runway end identifier lights.*
> *(vi) The visual approach slope indicator.*
> *(vii) The touchdown zone or touchdown zone markings.*
> *(viii) The touchdown zone lights.*
> *(ix) The runway or runway markings.*
> *(x) The runway lights.*

(d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.
(e) Missed approach procedures. Each pilot operating an aircraft, except a military aircraft of the United States, shall immediately execute an appropriate missed approach procedure when either of the following conditions exist:
(1) Whenever the requirements of paragraph (c) of this section are not met at either of the following times:
(i) When the aircraft is being operated below MDA

The Corporate Airlines J3201 Flight Manual, Section 7 Approach and Landing Section, pages 14 and 15[10] stated in part:

A missed approach is required when:
(E.) At MAP or DA as applicable, none of the following visual aids are identifiable:
1) *The approach light system, however, if the approach light system is visible, descent below 100' [feet] above the touchdown zone is not permitted unless the red terminating bars or the red side row bars are also visible.*
2) *The Visual Approach Slope Indicator (VASI).*
3) *The Runway End Identification Lights (REIL).*
4) *The threshold, the threshold markings, or the threshold lights.*
5) *The runway lights.*
6) *The touchdown zone lights.*
7) *The touchdown zone, or touchdown zone markings.*
8) *The runway or runway markings.*

FAA regulations and Corporate Airlines procedures were similar and allowed a pilot to descend below MDA only if he had appropriate visual clues.

Corporate Airlines Flight Manual, Section 7, Approach and Landing, page 10[11], section 23 stated in part:

23. Minimum Altitudes During Approach (FAR 91.129)
B. When approaching to land on a runway served by a VASI, the aircraft shall be flown at or above the glide slope.

14CFR Part 91.129 stated in part:

Operations in Class D airspace.
(e) Minimum Altitudes. When operating to an airport in Class D airspace, each pilot of
(3) An airplane approaching to land on a runway served by a visual approach slope indicator shall maintain an altitude at or above the glide slope until a lower altitude is necessary for a safe landing.

6.4 TRANSITION TO VISUAL CUES

[10] See attachment 8
[11] See attachment 9

The Corporate Airlines J3201 Aircraft Manual, Normals Section, page 57[12] stated in part:

> *Upon hearing the "RUNWAY IN SIGHT" call by the Non Flying Pilot, the Flying Pilot will transition to visual cues outside the cockpit, and upon seeing the runway/airport will state "GOING VISUAL. LEAVING MINIMUMS, FLAPS 35".*
>
> *The Non Flying Pilot will continue to monitor the approach and all flight instruments, and will callout any abnormalities.*

Interviews with Corporate pilots indicated that they were trained that the flying pilot (FP) was to monitor the flight instruments during an approach and the NFP was to look outside the airplane for visual clues while occasionally glancing at the flight instruments.

The FAA-H-8261-1 Instrument Procedures Handbook, Chapter 5 - Approaches, Approach Planning, Transition to Visual, stated in part:

> *The transition from instrument to visual flight during an instrument approach could be very challenging. One hundred to 200 feet prior to reaching the MDA, most of the PNF's attention should be outside the aircraft in order to visually acquire at least one visual reference for the runway, as required by the regulations. The PF should stay focused on the instruments until the PNF calls out any visual aids that can be seen, or states "runway in sight". The PF should then begin the transition to visual flight.*

Basic airmanship techniques are similar to the training Corporate Airlines pilots received. The flying pilot should be monitoring the flight instruments while the NFP had the responsibility of looking outside the airplane cockpit for the runway and/or the runway environment.

6.5 USE OF FLIGHT DIRECTOR

Corporate Airline manuals and procedures did not require the use of the flight director (FD) when a non-precision approach was performed. Whether to use the FD or not was the choice of the pilot. Post-accident interviews indicated that some pilots liked to use the FD and others did not. It could not be determined what percentage used the FD during approaches and it could not be determined from cockpit documentation or other sources whether the crew was using the FD during the accident approach.

The Corporate Airlines J3201 Flight Manual, Normals Section, page 50 stated in part:

> ***FD Policy***
> ***General***
> *"When hand flying the aircraft, it may be more desirable for the FP to request the NFP to manipulate the FD [flight director] controls.*
> ***Approach***
> *When engaging the FD always ensure that the proper modes have been selected on the Mode Select Panel (MSP)*

[12] See attachment 10

Use of the Flight Director

Approach

Use of the FD capabilities during an instrument approach can greatly reduce a flight crew's workload. The FD may be used for both precision and non-precision approaches and is capable of providing information to control the aircraft down to approach minimums.

Vertical Modes – Non-precision Approaches

Altitude guidance for executing non-precision approaches is commanded by VS [vertical speed] through the TCS [Touch Control Steering] button. IAS [indicated airspeed] mode can be used in combination with power reduction to control the rate of descent. Extra attention will be required to ensure the resulting rate of descent will be adequate to meet profile requirement.

Post-accident interviews indicated that, during training, it was stressed to pilots that it was important that they select a vertical guidance mode on the FD prior to selecting a horizontal guidance mode during an approach. If a vertical guidance mode was selected first, then when the vertical mode bar appeared on the flight director, it would indicate the selected mode (i.e. vertical speed, indicated airspeed, etc.) and provide the appropriate guidance. If a horizontal guidance mode was selected first, the vertical bar would also appear with the horizontal bar, but would not provide desired vertical guidance until a vertical guidance mode was selected. Pilots were instructed that this appearance of the vertical bar could mislead a pilot into thinking he had desired vertical guidance available. One instructor stated that this was really "drilled into the pilots" during training.

The flight director had an altitude hold capability. When the ALT button on the flight director mode selector was pushed, a signal was sent to the pitch indicator in the pilots attitude indicator. The pitch indicator would then indicate the appropriate pitch to maintain the airplane altitude at the time the button was pushed.

7.0 GROUND PROXIMITY WARNING SYSTEM (GPWS)

The Corporate Airlines Flight Manual, Section 11, Abnormal/Emergency Ops Section, page 16[13] stated in part:

Response to GPWS Warnings

A. Mode 1 through 4

If a Mode 1 through 4 occurs, immediately increase pitch attitude, and simultaneously add power to alter the aircraft's flight path sufficiently to stop the warning. If the approach cannot be safely continued, crewmembers shall execute a missed approach.

The FAA Advisory Circular AC 120-71A – STANDARD OPERATING PROCEDURES FOR FLIGHT DECK CREWMEMBERS stated in part:

GPWS WARNING ESCAPE MANEUVER

[13] See attachment 11

If a GPWS "PULL UP" warning or "TERRAIN" alert occurs at night or in IMC, perform the following maneuver entirely from memory:

Callouts: in "BOLD TEXT" -- Actions: with bullets (•) in plain text

Step	PF [pilot flying]	PM [pilot monitoring]
1	Thrust• Auto throttles - disconnect • "FIREWALL POWER," set firewall thrust Pitch • Autopilot - disconnect • Roll wings level • Rotate (3°/sec) to 20° pitch attitude. GPWS warning continues - increase pitch (respect stickshaker/buffet)	• Verify all actions have been completed and call out any omission • Monitor radio altimeter, and call ou information on flight path (e.g., "300 FEET DESCENDING; 400 FEET CLIMBING," etc.)
2	Configuration • Speedbrakes - retract • Do not alter gear/flap configuration	• Call out safe altitude (e.g., "MSA IS 3,400 FEET") • Advise ATC
3	• Climb to safe altitude	
4	• Resume normal flight. Retract flaps on flap retraction speed schedule.	

General airline industry standard procedures were that when a GPWS warning occurs, pilots should immediately execute the action recommended in their company procedures manual.
If there was no stated company procedure, an immediate pull-up should be initiated and continued until the GPWS warning stops and the crew determines that terrain clearance has been assured. An immediate pull-up procedure should be performed except in visual meteorological conditions when the pilots can immediately determine a false warning.

8.0 CONTROLLED FLIGHT INTO TERRAIN (CFIT)

Corporate Airlines training personnel stated that the company conducted CFIT training for pilots. The training included a video on CFIT, a handout of CFIT information, and a test on the CFIT information provided.

Corporate Airlines had no CFIT checklist for use by pilots.

9.0 COMPANY INFORMATION

Corporate Airlines was a privately held Part 121 air carrier that began operations in 1996 and was headquartered in Smyrna, Tennessee. At the time of the accident, Corporate Airlines

operated 11 British Aerospace Jetstream 3201 aircraft from pilot bases in St. Louis , Missouri and Nashville, Tennessee. There were 62 pilots including 32 captains and 30 first officers.

Corporate Airlines had a code share agreement with American Airlines to operate as American Connection. At the time of the accident, 100% of Corporate Airlines flights were operated as American Connection. Until the acquisition of Trans World Airlines (TWA) by American Airlines, Corporate Airlines had a previous code share agreement with TWA to operate as Trans World Express (TWE) out of STL. The company also had a previous code share agreement with Midway Airlines as a partner out of Raleigh, North Carolina until September 11, 2001.

At the time of the accident, the company provided service to the following cities from their bases:

STL – Cape Girardeau, Missouri
Ft. Leonard Wood, Missouri
Marion , Illinois
Kirksville, Missouri
Paducah, Kentucky
Quincy, Illinois
Owensboro, Kentucky
Burlington, Iowa
Evansville, Indiana
Nashville, Tennessee
Jackson, Tennessee

BNA - Atlanta, Georgia
St. Louis, Missouri
Tri-Cities, Tennessee (Bristol)

In January 2005, Corporate Airlines name was officially changed to Regions Air. This was a change that had been set in motion prior to the accident.

In December of 2004 the International Brotherhood of Teamsters was elected to represent the pilot group. The pilot groups efforts for representation by the Teamsters union was begun in the late summer of 2004

9.0 FAA OVERSIGHT

The FAA Air Carrier Certificate for Corporate Airlines was held in the Nashville, Tennessee Flight Standards District Office (FSDO). Corporate Airlines was awarded their Air Carrier certificate and began operating in December 1996. FAA Inspector Wes Jones was the original certification project manager when Corporate Airlines was applying for their operating certificate. When the airline received it's operating certificate, Inspector Jones was appointed Principal Operations Inspector (POI) and was in that position at the time of the accident.

Corporate Airlines operated under the FAA Surveillance and Evaluation Program (SEP) which guided oversight of the company.

A review of FAA's Program Tracking and Reporting Subsystem (PTRS) showed the following inspections completed on the Corporate Airlines certificate from 2001 until the date of the accident in 2004:

ACTIVITY	PTRS CODE #	FY- 2001	FY- 2002	FY - 2003	FY-2004
Focused Inspection	1615			1	2
Surveillance of Station Facility	1617	1			6
Inspection of Operations Manual	1621	1	5	3	12
Ramp Check	1622	6	23	17	36
Enroute Cockpit Observation	1624	5	9	17	12
Enroute Cabin Observation	1625			1	13
Surveillance of Training Program	1626	8	8	6	13
Inspection of Dispatch Records	1627		4	5	17
Inspection of Trip Records	1628	2	7	12	16
Inspection of Training Device	1630		7	4	
Inspection of Facility	1635	11	30	16	30
Surveillance of Operations Center	1636		1	3	13
Inspection of De-Ice Program	1637	1	1	4	2
Inspection of Cargo Operation	1638	2	6	2	4
Surveillance of Check Airman – Oral Exam	1641	14		11	2
Surveillance of Check Airmen - Simulator	1642	25	8	9	8
Surveillance of Check Airman - Aircraft	1643	1		2	1
Surveillance of Check Airman Administering a Line Check	1644	15	6	14	4
Surveillance of Check Airman During IOE	1645	12		5	8

Instruction					
Surveillance of Instructor	1662				1

Submitted by:

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Air Safety Investigator, Operations
March 7, 2005