NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 30, 2017

Group Chairman's Factual Report

OPERATIONAL FACTORS

DCA17FA109

Contents

A. ACCIDENT

Operator	Air Cargo Carriers (ACC)
Location	Charleston, WV
Date	May 5, 2017
Time	0651 Eastern Daylight Time (EDT) [1]
Vehicle	Shorts SD 3-30
Registration	N334AC

B. OPERATIONAL FACTORS

Lawrence Aaron McCarter - Chair
Air Safety Investigator – Eastern Region
National Transportation Safety Board
45065 Riverside Parkway
Ashburn, VA 20147

Sathya Silva, PhD
Human Performance Division (AS-60)
National Transportation Safety Board
490 L'Enfant Plaza East, SW
Washington, DC 20594-2000

Mark Landolt
Miami Flight Standards District Office
Federal Aviation Administration
2895 SW 145th Ave, Suite 120
Miramar, FL 33027

Steven Altnau
President
Air Cargo Carriers
5300 South Howell Drive
Milwaukee, WI 53207

Alison Campbell
Operations Inspector
Air Accident Investigation Branch
Farnborough House, Berkshire Copse Rd,
Aldershot GU11 2HH, United Kingdom

Bruce Schemmel[2]
Charleston Flight Standards District Office
Federal Aviation Administration
301 Eagle Mountain Rd, Room 144
Charleston, WV 25311

C. SUMMARY

On May 5, 2017 at 6:51 a.m. eastern daylight time (EDT), Air Cargo Carriers flight 1260, a Shorts

[1] All times Easter Daylight Time (EDT) unless otherwise noted.
[2] FAA Temporary and local ops group member during the on-scene portion. Replaced by Mark Landolt.

SD3-30, N334AC, crashed during landing on runway 5 at the Charleston Yeager International Airport (CRW), Charleston, West Virginia. The airplane was destroyed, and the two pilots suffered fatal injuries. The flight was operating under the provisions of 14 *Code of Federal Regulations* Part 135 as a cargo flight from Louisville International Airport (SDF), Louisville, Kentucky. Instrument meteorological conditions prevailed at the time of the accident.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board (NTSB) investigators from the Operations Group and the Human Performance Group traveled to Charleston, West Virginia on Friday, May 5, 2017. The group chairman was briefed by the Investigator in Charge (IIC) on the following day's plan. The Operations Group was formed with a party member from the Federal Aviation Administration (FAA) assigned. On Saturday, May 6, 2017, an additional briefing was carried out by the IIC , which included review of airport video, showing the accident airplane final approach and subsequent runway collision. A representative from Air Cargo Carriers (ACC) was added to the Operations Group.

The Operations and Human Performance group participated in on-scene activities, including documentation of the runway ground scars, wreckage pathway and a detailed examination of the final accident site location. This included cockpit documentation of flight controls, instrumentation systems, switches, and settings.

On Sunday, May 7, 2017, the Operations and Human Performance group continued to document the wreckage and were joined and assisted by the Air Accident Investigation Branch (AAIB)[3] Operations Investigator.

On Monday, May 8, 2017, the Operations and Human Performance group gathered personal effects and airplane evidence from the accident site and secured the items; this included 5 personal electronic devices including iPads and cell phones, airplane manuals, airplane/flight specific paperwork, and the Captains CPAP [continuous positive airway pressure] machine. The group took photographs and documented all items removed from accident site. The group then traveled to the General Mitchell International Airport (MKE), Milwaukee, Wisconsin to interview ACC Company personnel. In addition, the group documented an exemplar Shorts SD3-30 positioned in the ACC hanger.

On Tuesday, May 9, 2017, interviews of ACC personnel were conducted at company headquarters in Milwaukee, Wisconsin; an initial interview of FAA personnel at the MKE FSDO[4] including ACC Principle Operations Inspector (POI), Principle Maintenance Inspector (PMI), and Front-Line Manager (FLM) was conducted on May 10.

On Tuesday, May 16, 2017, a phone interview was conducted with a former employee of ACC who had flown as a First Officer with the accident Captain.

[3] In accordance with ICAO Annex 13, as the State of Manufacture for the airplane, the United Kingdom Air Accident Investigation Branch appointed an accredited representative to participate in the investigation.
[4] Federal Aviation Administration- Flight Standards District Office.

On Monday, June 19, 2017 and Tuesday, July 11, 2017, phone interviews were conducted with friends of the First Officer.

On June 26, 2017, NTSB operations group members travelled to the Milwaukee, FAA FSDO and conducted formal interviews with the FAA POI for ACC, and FLM. The AAIB and FAA party coordinator joined via teleconference.

E. FACTUAL INFORMATION

1.0 History of Flight

The accident crew (Captain and First Officer) was operating together on a permanent (CA/First Officer) pairing as a 14 *CFR* Part 135 United Parcel Services[5] (UPS) flight, with 3,874 lbs of cargo consisting of mail, packages and freight. The flight originated from the CRW base of operations and consisted of a round trip cargo flight to Louisville International Airport-Standiford Field (SDF), Louisville, Kentucky and subsequent revenue return to CRW.

On May 3, 2017, 2 days before the accident flight, the airplane being operated as flight #1259 departed CRW with 2,922 lbs of UPS cargo destined for SDF. According to the ACC Flight Log, the Captain was the pilot flying. The flight departed CRW at 2254 and landed in SDF 0006 on May 4, 2017, blocking into the gate 4 minutes later. The total flight time and block time were 1.1 hours and 1.3 hours respectively. The crew was provided a rest area in the UPS crew rest lounge for the layover, which was approximately 4.5 hours.

On the return flight, on May 4, 2017, 2,796 lbs of cargo were loaded onto the airplane. Flight #1260 departed the SDF parking area at 0515 and took off at 0528. The airplane arrived in CRW at 0637 and blocked into the parking area 4 minutes later.

The evening before the accident, on May 4 flight #1259 departed from CRW to SDF at 2237 with subsequent takeoff at 2242 with 3,874 lbs of cargo. According to the ACC Flight Log form 104, the First Officer was the pilot flying. The flight landed in SDF at 2358 and parked at 0003 on May 5. The total flight time was 1.3 hours and the total block time was 1.4 hours. Upon arrival in SDF, the crew had a layover of 4.5 hours in the UPS lounge.

The return leg (SNC1260) of the accident flight was a revenue flight back to CRW with 3,874 lbs of cargo. According to the ACC flight log and voice communications with the CRW Air Traffic Control (ATC), the Captain was the pilot flying when the accident occurred.

SNC1260 departed SDF at 0541 on an instrument flight rules (IFR) flight plan with an en route altitude of 9000 feet. There were no reported irregularities or operational issues reported during the takeoff and en route portion of the flight.

The visibility minimum for the CRW VOR-A approach was predicated on the airplane's approach category, which was based on the VREF approach speed of the airplane, in this case, the airplane falls in the category B circling approach criteria. For the accident flight, based on recorded air

[5] UPS Freight/cargo contract. Non-mainline.

traffic control (ATC) conversation, radar data and airport surveillance video, the airplane requested and flew the VOR-A approach utilizing category B altitudes and visibility requirements. During the time of the VOR-A approach to runway 5, the weather was reported as an overcast ceiling at 500 ft with 10 statute miles visibility and light winds.

The airplane was equipped with distance measuring equipment (DME) which allowed the crew to utilize FOGAG Fix Minimums, which were 1,600 ft and 1-mile visibility. FOGAG is at 6 DME from the CRW VORTAC on an approach course of 084º. It is an additional 2 DME to the MACSA missed approach point (MAP) which is a climbing left turn to 3,000 ft mean sea level (msl) via a heading of 055º and HVQ radial 069º to CAMMA intersection at 21 DME. The CRW VOR identifier (HVQ) is at navigation communications frequency 117.4.

The First Officer contacted CRW ATC at 0637 and advised they were at 9,000 ft msl and had information November. CRW responded, provided the CRW altimeter of 29.41 inches of mercury and advised SNC1260 to expect the localizer Runway 5 approach; several seconds later, the First Officer requested the VOR-A approach to which CRW approved and instructed SNC1260 to proceed direct to the Charleston VOR and descend and maintain 4,000 ft

At 0642, CRW ATC informed SNC1260 that they were twelve (12) miles from the CRW VOR and instructed them to cross the VOR at or above 3,000 ft msl and they were cleared for the VOR-A approach runway 5.

At 0646, CRW ATC instructed SNC1260 to contact the tower at 125.7 to which the First Officer acknowledged and subsequently contacted the tower and stated visual to VOR-A. The CRW tower cleared SNC1260 to land.

At 0647, CRW alerted SNC1260 to immediately check their altitude and reissued the altimeter setting of 29.41. The First Officer responded and stated they were at 2,200 ft msl and were descending to 1,600 ft, to which the tower responded and stated their alarm went off and it might have been due to SNC1260's rate of descent. The First Officer acknowledged.

At 0651, the accident occurred.

2.0 Flight Crew Information

2.1 The Captain

The Captain was 47 years old and resided in Charleston, West Virginia. His date of hire with ACC was July 1, 2015. Prior to ACC he was a "bush"[6] pilot with several cargo and passenger operators in Alaska. Friends of the Captain stated he slept "a lot" but did not appear to have a lack of energy or be unhealthy. He wore a CPAP machine when he slept. According to his girlfriend, he occasionally drank alcohol on weekends[7]. He ate well. He was overweight, but was attempting to lose weight by playing sports several times a week. He was reported to be in positive spirits. There was no history or reports of illicit drug use or alcohol abuse.[8]

[6] Bush pilot is an informal definition of a person who flies small aircraft into remote areas that are inaccessible to or off the route of larger planes.
[7] See witness statement(s) for expanded information.
[8] See Human Performance factual report for expanded information on the Captain.

2.1.1 The Captain's Pilot Certification Record

The Captain was current and qualified under Air Cargo Carriers and FAA requirements. A review of FAA records found no incidents or accidents involving the Captain. A review of the Captain's FAA complete airmen file Program Tracking and Reporting Subsystem (PTRS)[9] data found several notices of disapproval going back to 1999. [10]

- Private Pilot – Airplane Single Engine Land certificate issued July 21, 1999.
- Private pilot- Airplane Single Engine Land, Instrument Airplane issued August 13, 2001.
- Commercial Pilot – Airplane Single Engine Land, Instrument Airplane certificate issued August 18, 2002.
- Flight Instructor – Airplane Single Engine, certificate issued September 25, 2003 and subsequent reissues on September 28, 2005, September 25, 2007, September 24, 2009, September 6, 2011, September 3, 2013, September 15, 2015 and September 22, 2016.
- Commercial Pilot- Airplane Multi-Engine Land, certificate issued February 13, 2003
- Commercial Pilot – Airplane Single Engine Land, Instrument Airplane; Rotorcraft Helicopter certificate issued February 7, 2006.
- Commercial Pilot – Airplane Single and Multiengine Land, Instrument Airplane certificate; Second-in-command (SIC) Type Shorts SD-3 issued July 2, 2015
- Airline Transport Pilot (ATP) – Airplane Multi Engine Land Shorts- SD3 Commercial Privileges Airplane Single Engine Land certificate issued July 25, 2016.

During the Captain's ATP certificate check ride, on July 22, 2016, the Captain received a notice of disapproval due to excessive deflection of both the glideslope and localizer for an instrument landing system (ILS) approach, and repeated glideslope and sink rate warnings from the ground proximity warning system (GPWS), and his subsequent failure to initiate a go-around. He passed the practical re-examination 3 days later.

On September 3, 2003, the Captain received a notice of disapproval for a Flight Instructor, Airplane Single Engine Land (ASEL) rating, for Area of Operations VII, Normal and Crosswind Approach and landing. He passed his practical examination 3 weeks later.

On January 28, 2003, the Captain received a notice of disapproval for his Commercial; Airplane Multi Engine Land rating due to lack of performance in area VIII; emergency operations and area IV; Takeoffs/Landings, and Go Arounds. He passed the practical examination 2 weeks later.

On July 14, 1999, the Captain received a notice of disapproval during his private pilot certificate

[9] The Program Tracking and Reporting Subsystem (PTRS) was a comprehensive information management and analysis system used in many Flight Standards Service (AFS) job functions. It provides the means for the collection, storage, retrieval, and analysis of data resulting from the many different job functions performed by Aviation Safety Inspectors (ASIs) in the field, the regions, and headquarters. This system provides managers and inspectors with the current data on airmen, air agencies, air operators, and many other facets of the air transportation system. Source: FAA.

[10] FAA complete airman file. Source Airman Certification Branch, FAA, DOT.

practical examination due to lack of performance in the area of IV; Takeoffs, Landings, and Go-Arounds, VI; Navigation and IX; Emergency Procedures. He passed the practical examination 1 week later.

2.1.2 The Captain's Pilot Certificates and Ratings Held at Time of the Accident[11]

Airline Transport Pilot (issued July 25, 2016) Airplane Multi Engine Land with a Shorts-SD3 Commercial Pilot Airplane Single Engine Land; Rotorcraft helicopter – English Proficient.

Medical Certificate – First Class (issued June 23, 2016) Limitations: Must have available glasses for near vision.

2.1.3 The Captain's Training, Proficiency Dates and Flight Times

Date of Hire		July 1, 2015
Date Originally Upgraded/Transitioned to captain Position		July 25, 2016
Date Upgraded/Transitioned to captain on SD3-30		July 25, 2016
Total Flying Time		4368.5
Total PIC Time		3970
Total Time in Accident Airplane		1094.1
Total PIC Time in SD3-30		578.8
Total Flying Time	Last 24 Hours	4.2
	Last 30 Days	70
	Last 90 Days	180.9
	Last 12 Months	609.0
Date of Initial Type Rating on SD3-30		July 25, 2016
Date of Most Recent Recurrent Ground Training		July 15, 2016
Date of Most Recent Proficiency Check		January 18, 2017
Date of Most Recent PIC Line Check		July 25, 2016

2.1.4 Captain's Employment Pilot Background

In accordance with the Pilot Records Improvement Act (PRIA)[12] Each certificate holder shall—

> *(1) Maintain current records of each crewmember and each aircraft dispatcher (domestic and flag operations only) that show whether the crewmember or aircraft dispatcher complies with the applicable sections of this chapter, including, but not limited to, proficiency and route checks, airplane and route qualifications, training, any required physical examinations, flight, duty, and rest time records; and*
>
> *(2) Record each action taken concerning the release from employment or physical or professional disqualification of any flight crewmember or aircraft dispatcher (domestic and flag operations only) and keep the record for at least six months*

[11] Information from Air Cargo Carriers personnel files
[12] https://www.faa.gov/pilots/lic_cert/pria/guidance/

thereafter.

Title 49 U.S. Code § 44703 "Airman Certificates" stated that an air carrier shall request and receive the records pertaining to "the training, qualifications, proficiency, or professional competence of the individual, including comments and evaluations made by a check airman designated in accordance with 14 *CFR*s 121.411, 125.295, or 135.337 of such title."

According to FAA Advisory Circular 120-68H, Appendix H, "an operator is encouraged to request FAA records of proficiency/competency and airmen certification practical test results, in addition to the standard PRIA request."

ACC performed the standard PRIA request and did not, nor were they required to request the "complete airmen file."[13]

2.1.5 Captain's Application to ACC

The Captain's employment file included a standard pilot resume and shows objectives, flight time, certifications, employment history and education followed by the ACC application /questionnaire. [14] On the ACC application/questionnaire, there are 27 questions inquiring about the applicant's skills, willingness to work, and specific pilot information. Eight (8) of the questions ask about past failures of tests, disciplinary actions, accidents and DUI's. Question 17 asks:

Have you ever failed any check rides, proficiency checks, IOE or line checks?

The Captain answered "no."

The standard PRIA request was requested and it did not yield practical test/certification results which would have indicated previous failure of a check ride(s).

2.1.6 The Captain's Previous Pilot Employment

- October 2014 - June 2015: Grant Aviation; Alaskan Bush Pilot; Part 135; PRIA Confirmed; flight training records showing satisfactory completion records for flight operations, en route maneuvers, CFIT [controlled flight into terrain] and normal/abnormal procedures along with an objective curriculum.

- April 2014 – October 2014: Alaska Seaplanes; PRIA Confirmed; Including knowledge, proficiency, medical and en route checks in addition to drug/alcohol testing history.

[13] Advisory Circular 120-68H, Dated April 21, 2017. For additional guidance see the entire AC. https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1031148

[14] ACC application/questionnaire is not a formal name for the document; there is no title on the document. The name was derived by the operations group chairman based on the questions contained in the document.

- May 2013 – March 2014: Lliamna Air Taxi, Alaska; No PRIA Records confirmed. A request for PRIA was signed and submitted on May 19, 2015 but there were no return records in his file.

- July 2012 - April 2013: GTA Air Inc.; Part 135 Cargo; PRIA Confirmed; Including knowledge, proficiency, procedural, test results and en route checks.

2.2 The First Officer

The First Officer was 33 years old and resided in Charleston, West Virginia. Her date of hire with ACC was November 16, 2016. Prior to ACC she was a flight attendant with Republic Airlines. According to friends and family, the First Officer had always wanted to be a pilot and was "pursuing a dream." Friends and family of the First Officer stated she was positive and healthy. She was very adaptable. According to pilot-rated friends, she had a difficult time getting used to the night flying, but her positive outlook and healthy lifestyle helped her to adapt quickly. She had no reported drug or alcohol abuse and according to friends she rarely drank. Her sleep patterns were reported as 7 to 8 hours of rest post flight. [15]

2.2.1 The First Officer's Pilot Certification Record[16]

The First Officer was current and qualified under Air Cargo Carriers and FAA requirements. A review of FAA records found no incidents or accidents involving the First Officer. A review of the First Officer's FAA complete airmen file Program Tracking and Reporting Subsystem (PTRS) data found one notice of disapproval in 2015.

- Private Pilot – Airplane Single Engine Land certificate issued February 17, 2015.
- Private Pilot – Airplane Single Engine Land, Instrument Airplane certificate issued April 26, 2015.
- Commercial Pilot – Airplane Single Engine Land, Instrument Airplane certificate issued September 16, 2016.
- Commercial Pilot – Airplane Single and Multi-Engine Land, Instrument Airplane; SD3 Second in Command; November 21, 2015.
- Airline Transport Pilot – N/A.

On September 7, 2015, the First Officer received a notice of disapproval for her Airplane Single Engine Land, Instrument Airplane Commercial certificate due to lack of performance in area IV; Takeoffs/Landings and Go Arounds and VI; Ground reference maneuvers. She passed the practical exam 9 days later.

2.2.2 The First Officer's Certificates and Ratings Held at Time of the Accident

Commercial Pilot Airplane Single Engine Land, Airplane Multi Engine Land, Instrument Airplane Limitations: English Proficient, SD-3 SIC privileges only

[15] See Human Performance factual report for expanded information on the first officer.
[16] FAA complete airman file. Source Airman Certification Branch, FAA, DOT.

Medical Certificate – First Class (issued December 23, 2015) Limitations: None

2.2.3 The First Officer's Training, Proficiency and Flight Times[17]

Date of Hire	November 16, 2016
Date Originally Upgraded/Transitioned to First Officer Position	NA
Date Upgraded/Transitioned to First Officer on This Airplane	NA
Total Flying Time	652.4
Total PIC Time	0 with ACC/ 214
Total SIC Time	333.6
Total SIC Time in SD3-30	333.6
Total Flying Time Last 24 Hours	4.2
Last 30 Days	70
Last 60 Days	135.2
Last 90 Days	192.2
Last 12 Months	333.6 with ACC since
Date of Most Recent Recurrent Ground Training	November 17, 2016
Date of Most Recent Proficiency Check	November 16, 2016
Date of Most Recent SIC Line Check	November 16, 2016

2.2.4 The First Officer's Employment Pilot Background[18]

This was the First Officer's first professional pilot job; she had no background as a professional pilot.

2.2.5 First Officer's Application to ACC

The First Officer's employment file included a standard pilot resume and shows objectives, flight time, certifications, employment history and education. There was no ACC application /questionnaire on file similar to the Captains, however, there was an Employment Application on file. On the First Officer's employment application, there were eight (8) questions that asked about past failures of tests, disciplinary actions, accidents and DUI's. On the section under certificates and experience, question 4 asks:

Have you ever failed any check rides, proficiency checks, IOE or line checks?

The First Officer answered Yes and answered, "I failed single engine commercial and multi-engine commercial check rides."

The standard PRIA request was requested and it did not yield practical test/certification results which would have indicated previous failure of a check ride(s).

[17] Source: ACC Personnel records.
[18] Source: ACC Personnel records.

2.2.6 The First Officer's Previous Pilot Employment

No PRIA records exist for the First Officer as this was her first professional pilot job. The First Officer was previously a Republic Airlines Flight Attendant from June 2013 until her hiring at ACC.

2.2.7 The Captain and First Officer's 72-Hour History

See the Human Performance Factual Report for the 72-Hour History.

2.3 Medical and Pathological Information

For medical and pathological information, see the Medical Factual Report for this accident.

3.0 Crew Responsibilities

3.1 Captain Duties and Responsibilities[19]

According to the ACC flight operations manual (FOM), page Chapter 6 Page 5, the Captain, as pilot-in-command, had the following responsibilities:

> *The Captain shall have operational control over his individual flight after initial release by the Company, and has full responsibility and final authority during the flight. Safety is the primary concern. He shall not operate an aircraft in a careless or reckless manner or so as to endanger life or property. The Captain is responsible for the preflight planning and initiation of the flight, in compliance with FAR's, FOM, Op Specs, & SOP procedures. The Captain is responsible to ensure that the First Officer is conducting his duties in a manner that promotes maximum effectiveness and efficiency of operations.*
>
> *1. The Captain will check all weather, NOTAM's (with special concern to FDC & Temporary Flight Restrictions) and PIREP's to determine if the flight can be accomplished within the parameters of this Manual and the FAR's. The initial weather briefing must be conducted via FSS or other approved weather sources listed in the Op. Specs. Dispatch can supplement the initial briefing.*
>
> *2. The Captain may delegate preflight inspections and aircraft preparation to the First Officer. The First Officer will report any abnormal findings directly to the Captain. The Captain will then determine the airworthiness of the aircraft as outlined in Chapter 8 of this Manual.*
>
> *3. The Captain will ensure the proper fuel amount for the flight is uploaded prior to departure.*

[19] Excerpt from ACC FOM Captain Duties and Responsibilities. Source: ACC.

4. After the First Officer reports the aircraft pre-flight status, the Captain will contact Dispatch at 800-253-1711 with the following pre-departure information at least 30 minutes prior to scheduled departure time (see notes below):

a. Flight number
b. Aircraft tail number
c. Captain & First Officer names
d. Aircraft status Green = No abnormalities. Yellow = Abnormality noted, flight will continue. per MEL/MCO Red = Need immediate maintenance attention prior to flight.
e. Weather status Green = No WX concerns. Yellow = Minor WX concerns (i.e. destination at mins). Red = Major WX concern (i.e. below mins, cannot continue until WX improves).
f. Alternate Airport List if destination WX conditions yellow or red. Use 3-letter identifier.
g. On duty Zulu time

NOTE: If you have advanced warning of a delay to your schedule, contact Dispatch as soon as possible and advise of type of delay and estimated time of departure.

NOTE: If the crew show-time precludes making the pre-departure call at least 30 minutes prior to departure, the pre-departure call will be made as soon as practical prior to departure. 6.7

CAPTAIN DUTIES AND RESPONSIBILITIES - Preflight

5. The Captain shall ascertain that before takeoff, no frost, ice, or snow is adhering to the wings,
control surfaces or other critical areas. See Chapter 6, Page 16.

6. The Captain shall determine that the aircraft is loaded within weight & balance limitations for that flight and Form 102 is correct and complete.

7. The Captain is responsible for the safety of the passengers, pilots, cargo and the aircraft.

8. The Captain shall ensure all required forms are complete and signed prior to departure. These are Forms 102 & 104, and HAZMAT Pilot Notification Forms.

9. The Captain shall ensure all required navigational charts are in current revision status. The Company uses Jeppesen navigation chart service and/or NOS charts. The First Officer is responsible to complete the update.

10. The Captain shall ensure cargo is secure (FAR 135.87).

-Enroute

11. The Captain shall comply with FAR's, FOM, SOP's, and the AFM.

12. The Captain shall keep the First Officer informed of Company and flight information.

13. The Captain, in an emergency situation that requires immediate decision and action, may take any action he considers necessary under the circumstances. Deviation may be to the extent required to meet the emergency FAR 91.3. FAR 135.19 also provide for the PIC, in an emergency to deviate from the rules of part 135. The Captain will submit a report to the company immediately after the emergency situation, and the company will submit a report to the appropriate FAA facility with 10 working days if required. The certificate holder may deviate from FAR 135 regulations to safeguard persons or property, during a natural disaster, using the aircraft not listed on the Operations Specifications for emergency operations performed. (FAR 119.57). The FAA must authorize the operator, either in writing (Op. Specs. Change) or verbally, if time is of the essence.

14. In the event that an engine fails, or its rotation is stopped to prevent possible damage, the Captain shall land at the nearest suitable airport at which a safe landing can be made.

15. The Captain shall ensure that the aircraft trend monitoring data is recorded from one segment per duty day.

16. The Captain shall notify the Company if the flight will deviate to an airport other than the planned destination, via Vendors radio, FSS or an FBO.
-Destination

17. The Captain shall ensure all cargo is removed all cargo compartments.

18. The Captain shall ensure all required forms and log entries are completed accurately.

19. The Captain shall receive a post flight (verbal) report from the First Officer.

20. The Captain shall contact Flight Following with all information (in order) from the form 113. See Chapter 10 for an example of Form 113.

6.8 PAPERWORK
Scheduled Operations

*1. **Daily – If flight is re-routed due to weather/customer/company request and any additional services are paid for i.e. deice, fuel, landing, parking, lodging you are required to fax the Fuel/Fees Report (Form 108) along with receipts.*

2. The Captain shall deliver all paperwork to the Principal Office upon completion of an assignment, or, in the case of out-based aircraft, completion of a scheduled route week, sent via USPS (postal).

3. The paperwork shall include at least the following:
a. Pink copies of Aircraft Daily Flight Log (Form 104).

b. Fuel receipts and Fuel/Fees Report (Form 108).
c. Hazardous Materials Pilot Notification (Form 115) & any Shippers hazardous materials declarations(s).
d. TSA – Form 118 as required.

On-demand Operations

4. Captain must immediately fax to the MKE office the Fuel/Fees Report (Form 108) with the receipts.

5. After the completion of the trip the Captain will mail (USPS) the following to the MKE office:
a. Pink copies of Aircraft Daily Flight Log (Form 104).
b. Fuel/Fees report. (Form 108)
c. All trip charge receipts. Write trip # on receipts.
d. Proof of Delivery forms (P.O.D.)
e. All customer paperwork. Write trip # on paperwork.
f. Hazardous Materials Pilot Notification & Shippers hazardous materials declarations(s).
g. TSA – Form 118 as required.

ALL COMPLETED AIRCRAFT LOGBOOKS WILL BE SENT BY UPS SECOND DAY AIR. YOU WILL NEED TO CALL OR EMAIL DISPATCH WITH THE TRACKING NUMBER

3.2 First Officer Duties and Responsibilities[20]

According to the ACC FOM, page 6-8, the First Officer (as SIC) had the following responsibilities:

The primary duty of the First Officer is to assist the Captain and to carry out assigned duties in an efficient manner. He advises the Captain of any irregularities that come to his attention and immediately relays to the Captain all instructions and information directed to the flight from any source.

-Preflight

1. The First Officer shall conduct the aircraft preflight inspection. This includes the following:
a. External checks.
b. Internal checks.
c. Checking Aircraft Daily Flight Log for discrepancies. See Chapter 8, Page 1.
d. Review the Form 101.
e. Initial preparation of Forms 102, 104, 108 & 113.

[20] Excerpt from ACC FOM Captain Duties and Responsibilities. Source: ACC.

Immediately after conducting the preflight, the First Officer will report any irregularities to the Captain. At that point the Captain will contact Company with pre-departure information.
Notify the Captain immediately if the aircraft is contaminated with snow, ice, or frost, or conditions exist that may require the aircraft to be deiced.

2. The First Officer shall confirm all required navigation charts are on board and will insert and document all revisions. The Company uses Jeppesen navigation chart service and/or NOS charts.

3. The First Officer shall ensure the cockpit checklist is available at the flight deck.

4. The First Officer shall ensure the following Manuals are accessible on the flight deck: AFM, Crew Manual, Weight & Balance Manual, Current FAR's, Current CFR 49 parts 100-177, Aircraft MEL, FOM, and Op. Specs.

5. The First Officer shall ensure proper refueling of the aircraft. See this chapter 6.10.

6. The First Officer shall supervise and help (as required, route specific) load the aircraft and shall ensure all cargo nets are secure (FAR 135.87). You will be required to help when a loader is missing, loading is behind schedule or could become behind schedule. This is an assigned duty for charter flying.

-Enroute

7. In the event the Captain becomes incapacitated, the First Officer has the authority to assume the responsibilities of the Captain, until the aircraft has been landed safely.

8. The First Officer shall keep the Captain informed of Company and flight information.

9. The First Officer shall assist the Captain as required.

-Destination

10. The First Officer shall undo cargo straps at the destination.

11. The First Officer shall open all cargo doors and assist in unloading as required.

12. The First Officer shall install both prop ties and the tail-stand, and chock the wheels.

13. The First Officer shall conduct a post flight inspection and report any irregularities to the Captain.

14. The First Officer shall ensure all cargo is removed from all cargo compartments. When cargo nets are utilized, they will be unrolled to check for cargo.

15. After cargo is removed, the First Officer shall secure all doors and ensure all "hot" electrical items are off (Nav lights, F/O flood light, electrical master & batteries).

16. The First Officer shall replenish the flight kit with required forms and logs. Notify Flight Following for form replenishment with sufficient notice so that forms and logs do not have to be delivered via the expensive overnight or next-day delivery service.

17. The First Officer shall revise all company charts.

18. The First Officer shall sweep out the cargo compartment once a week, and clean the flight deck after every flight.

19. The First Officer shall ensure all aircraft doors are closed prior to leaving the aircraft.

4.0 Company Information

4.1 Operational Control

Flights operating under the provisions of 14 *CFR* Part 135, such as the accident flight, were required to comply with 14 *CFR* Part 135.77 "Responsibility of Operational Control" which stated the following:

"Each certificate holder is responsible for operational control and shall list, in the manual required by §135.21, the name and title of each person authorized by it to exercise operational control."

Operational control was outlined in the ACC Operations Specifications (OpSpecs) A008-68 which stated the following:

The system of operational control for Part 135 operations must ensure that each pilot is knowledgeable that the failure of a pilot to adhere to the certificate holder's directions and instructions, or compliance with directions or instructions from an aircraft owner (other than the certificate holder), or any other outside private person or private entity, that are contrary to the certificates holder's direction or instructions, while operating aircraft under these operations specifications, may be contrary to Parts 119 and/or 135, and therefore may be subject to legal enforcement action by the FAA.

(c) These requirements do not apply to the following:

(i) Air Traffic Control instructions, clearances, Notices to Airmen (NOTAMs) received from FAA or cognizant Air Traffic Control authorities.
(ii) Aeronautical safety of flight information received by the pilot, and,
(iii) Operation under the emergency authority of the PIC in accordance with Section 91.3(b), and/or Section 135.19(b).

According to the ACC FOM, Section A- 11 (Rev 75) dated May 5, 2016, the following individuals, have been designated to exercise operational control for authorization of any flight:

- Director of Operations
- Director of Maintenance
- Chief Pilot
- Flight Dispatchers (5)
    - Dispatcher 1
    - Dispatcher 2
    - Dispatcher 3
    - Dispatcher 4
    - Dispatcher 5

4.1.1 Management Duties

Title 14 *CFR* 119.69[21] Management personnel required for operations conducted under part 135 of this chapter, stated the following in part:

> *(a) Each certificate holder must have sufficient qualified management and technical personnel to ensure the safety of its operations. Except for a certificate holder using only one pilot in its operations, the certificate holder must have qualified personnel serving in the following or equivalent positions:*
>
> *(1) Director of Operations.*
>
> *(2) Chief Pilot.*
>
> *(3) Director of Maintenance.*

At the time of the accident, ACC had the required and qualified management personnel for operations being conducted under Part 135.

4.2 Director/Manager of Safety

The ACC FOM did not list the title of Director or Manager of Safety as part of its "Management Hierarchy" and subsequent interviews with management personnel and employees confirmed that no individual was directly responsible for safety, however, FOM Section 4.2 states in part:

> *2. The President shall appoint management personnel who meet the qualification of FAR 119.71 as well as additional management personnel to ensure safety in Company operations. He shall inform them of their respective duties, responsibilities, and authority (FAR 119.69).*

[21] Management personnel required for operations conducted under Part 135 are found in 14 *CFR* 119.69.

4.3 Flight Following (Dispatch)

The *CFR*s and ACC OpSpecs[22] A008 did not require 14 *CFR* Part 135 operators to have Part 121 or Part 121-like dispatchers. ACC utilized the services of flight followers in the place of fully certified dispatchers. The below text, is a brief synopsis (excerpt) of an operational day Dispatch as stated by the ACC Dispatch Lead.

> *"Beginning of shift, Dispatch will review emails to see if there were any issues from the previous shifts (MELs, Write ups, weather issues, tail swaps and crew staffing). The dispatcher going "off shift" will verbally give a pass down brief along with an email pass down of the day's event(s); the dispatcher on duty will re-check our system weather to confirm if there might be any potential issues and come up with potential alternate plans. If there are weather concerns then we will call the customer to give them a heads up and possibly plan for alternate means of transportation, delay the aircraft until weather has cleared, or different destination if weather is bad at arrival airport. With weather, as we both know, it changes sometimes without warning and crews will call in to inform us what is going on. We will discuss the event and the options but the final decision is the pilots, and then we will notify the customer.*
>
> *Dispatch will run through airport NOTAMS to all airports we fly to at least 3 times a day and pass along anything that may affect the flight to the crews on their pre-departure calls or emails. This is a secondary "backup' plan. In our FAR 135 operation the crew is required to obtain their preflight weather briefing from approved sources. Dispatch will supplement an initial briefing, especially during special weather events to assist in a go, no go decision.*
>
> *If crews or mechanics call in with MEL's or Write ups, we will enter them into our system, FOS (Flight operations software). This could be pre-departure or after arrival at destination, depending when discovered. Once our aircraft are in the air we track them on Flight Explorer, we also have a big screen tv that always has flightradar24 to track aircraft and weather as a backup, if for some reason Flight Explorer is not available.*
>
> *Flight plans are pre filed (stored) by Leidos (Lockheed Martin Flight Service) but if for some reason we need to make a change to the destination or routing due to weather or a VOR that is out, we will refile using Jeppesen FliteStar and send the plan to the flight crew."*

The Lead Dispatcher used a CRW based crew/flight as an example below:

> *1. Crew is to duty on at the airport one hour prior to scheduled departure time.*
> *2. Times are predetermined with the customer and confirmed with ACC to determine flight, and rest regulations legality.*
> *3. Crews will then look at weather, head out to the aircraft to perform the preflight inspection, supervise fueling if required, and supervise/assist in loading.*

[22] Operations Specifications.

4. Once completed they will call Dispatch with their pre departure call "green/green" to let us know the status of aircraft and weather. This call is like a stop light and any combination can be used.

- *Green/Green –Aircraft nothing noted out of the ordinary on inspection/ Weather no foreseen issues.*
- *Yellow/Yellow –Aircraft item is deferred per MEL/Weather alternate airport needed per regulation.*
- *Red/Red –Aircraft has a write up and cannot go until fixed/ Weather at departure point or destination below minimums cannot go.*
- Any new messages will be passed along to the crew.

5. Crew will depart and the next time a Dispatcher talks to them is when they are on the ground at their destination.

o Will proved call in information/times (Form 113 data)
o Report any mechanical issues as necessary found in flight or on post flight walk around.

Once in KSDF, after offload and walk around, crew will head inside to the UPS facility. Here they have a few options to hang out. There is a TV room, cafeteria, or head off to the quite room to get a few hours of sleep.

For the return back to KCRW the crew will do the same steps (1-5) noted above. When completed, the crew will duty off for rest. This flight is a typically a 9- hour duty day with 3.0 hours block time.[23]

4.4 Pilot Hiring and Training

The ACC Pilot Training Program (PTP) states that it is a standardized curriculum for training of Air Cargo Carriers pilots. The PTP consists of four modules: Initial; Recurrent; Upgrade; and Requalification. Initial training will ensure pilot proficiency in procedures and techniques, and will provide the information essential to the safe and efficient conduct of assigned duties. Recurrent training is intended to refresh the pilots in the same subjects and ensure their continued proficiency. Upgrade training covers the same subject areas as the initial training program, but may be accomplished in less time. Requalification training is given to crewmembers that have become unqualified. The PTP comprises three Company volumes, each containing a Record of Revisions page:

Pilot Training Program – General Subjects (this manual). Applicable to all phases of training & all aircraft.

Pilot Training Program – SD3 Training subjects applicable to the Shorts SD3 aircraft.

Pilot Training Program – SD3 – SOP Standard Operation Procedures, Shorts.
The PTP also incorporates the following government manuals:

FAA National Dangerous Good Operations and Training Manual. (FAA issued program)

[23] This example matches the accident flight in terms of duty/block time.

TSA Twelve-Five Standard Security Program including In-flight and Ground Security Coordinator Training. (TSA issued program)

The Director of Training stated that the structure of ACC's training in totality includes 4 to 6 weeks of training which includes basic indoctrination, systems, procedures and the Shorts simulator located in New York City. He stated that a typical first officer comes into ACC with a total of 800 flight hours total time; instrument proficiency was "big" and "attitude is the most important."

Due to the current pilot environment, the director of training stated, "ACC must sometimes hire Captains off the street" in order to meet the quickly changing pilot environment. He stated that the training program was constantly evolving in order to meet the new demands placed on company hiring and retention. There have been three new hire classes over the past 4 months as of May 2017.[24]

He stated that once the phone call is made to offer a pilot a job, ACC gives them up to 2 weeks to "get their lives" in order. When the potential employee arrives, week one is spent as indoctrination. Week two is systems and week three is procedures. Week four is the simulator and check ride. Week five is differences training between the two distinct models of Shorts Aircraft; the SD3 and SD6. When the course was completed, the new hires would depart on a Friday and be flying the following Monday.

When asked about the large number of classes for incoming pilots and the individual failure rate, he stated he did not know the number, however, the past few classes, all of the pilots passed and graduated. There was an average of 4 to 6 pilots per class and zero failures over the last four classes.

4.5 Crew Resource Management (CRM)

The initial course for CRM[25] was provided to pilots during initial new hire training. This course was a 2-hour segment, consisting of a live presentation combined with 17 PowerPoint slides covering topics on CRM background and skills, effective communication, teambuilding, attitudes and decision making, situational awareness, workload management, and stress and error management.[26] The chief pilot stated that CRM training "started when they walk into training and ends when they leave."

A review of the Captains ACC training records show that he received Captain upgrade training in CRM on July 12, 2016. There were no CRM records located for initial training for the Captain.

A review of the First Officer's training records show that she received her initial CRM training on September 16, 2016.

[24] See Attachment 1 - Operations/Human Performance Interview Summaries for more detailed information.
[25] Title 14 *CFR* 135.330 Crew Resource Management Training, stated that each certificate holder must have an approved crew resource management training program that includes initial and recurrent training.
[26] See CRM Training Attachment

4.6.1 Crew Base Assignments & Pairings

Crew assignment/pairings were base specific. In the case of CRW, two pilots; one Captain and one First Officer were assigned to each base. Pilots did not rotate in/out and were permanently paired with each other. There was no formal rotation schedule; they were essentially "partners." Pilots could make a bid for other bases or they could be reassigned based on need. If a pilot called in absent, the chief pilot or designee would fill in for the absent crew member. When asked about the pros and cons of permanent crew pairings, the chief pilot stated, "a con was that people could pick up bad habits." When the FAA POI was asked about ACC's outstation model, he stated he was not aware of pilot experience levels or crew pairing issues; they didn't get into that. He stated that he only looked at whether pilots were conducting a safe operation…" As a positive aspect of the permanent crew pairings, he stated he "considered two pilots flying exclusively together to be beneficial as there was value in familiarity with the other person." [27]

4.6 Federal Aviation Administration (FAA) Oversight

The MKE, FAA FSDO provides operational and maintenance oversight to ACC. The POI and PMI provide a clear majority of the oversight of the operation. The POI has six (6) part 135 operations that he oversees. These range in size from single pilot & single engine aircraft to operators that have over 20 turbot-jet aircraft. In addition, he is POI for a number of part 91 corporate operators, but could not recall or guess as to how many. According to the POI, ACC is in the middle to slightly above [in terms of complexity and size] to all the part 135 carriers he inspects.

Surveillance is conducted based on risks as determined by the safety assurance system (SAS)[28] model. According to the POI, ACC is considered to have a positive relationship with the FAA. When asked about the quality of the company, he stated "they [ACC] had a strong training program which is conducted in-house and they didn't outsource any training outside of the company." The POI expressed that recommendations/suggestions made by him were addressed "without fail."

When asked about what internal oversight programs existed at ACC, he stated that "they only have a voluntary disclosure program (VSD)[29] and do not have any formal safety programs."

According to the POI, The FAA is not strictly limited to SAS checklists for determining what will be observed or surveilled. FAA inspectors can rely on "gut instinct" and their own expertise to look at an operator. In the weeks after the accident, they increased their surveillance and observed check airmen in LaGuardia [simulator] and conducted Captain upgrade check rides. [30]In addition,

[27] See Human Performance Interview Summary Attachment for additional information.
[28] Safety Assurance System: System to optimize safety by the identification of hazards within an environment and to eliminate or control their associated risk by performing Design Assessments (DA) and Performance Assessments. (PA) For more information on SAS, please see FAA Order 8900.1 Volume 10.
[29] VSD Synonymous with VDRP: Voluntary Disclosure Reporting Program provides incentives for an air carrier, repair station, qualified fractional ownership program, or other eligible FAA-regulated entity to voluntarily identify, report, and correct instances of regulatory noncompliance. See AC 00-58B - Voluntary Disclosure Reporting Program.
[30] See Attachment 1- Operations/Human Performance Interview Summaries for detailed information.

the POI travelled to the outstations of Danville and Warsaw to conduct ramp inspections of the aircraft and flight crews. The POI also jump-seated on a flight on June 23, 2017.

When asked about any irregularities or issues he observed during these latest observations, he stated that the check ride was unsatisfactory because the pilot continued "an unstabilized approach." He considered this an individual pilot issue and not an issue with the training or manuals. The POI was unable to recall the last time he observed CRM training.

When the POI was unable to conduct surveillance and another inspector is travelling to an outstation or facility, they share duties when available; he provides his PMI counterpart a checklist to conduct surveillance on manuals and ramp operations.

When asked about top issues he's seeing during check rides, "pilots are failing to notice an unstabilized approach and take corrective action and go around." But he feels it's more of a "rushing to get the check ride done." And for "time savings" He assessed ACC training on unstabilized approaches and felt it was adequately addressed in the SOPs.

The FLM oversees 15 inspectors; Nine (9) airworthiness inspectors and six (6) operations inspectors. The MKE FSDO is two (2) inspectors short. He feels they could use two additional operations inspectors. When asked if the POI ever expressed any concerns regarding his surveillance of ACC, he replied that "nothing sticks out."

He considers ACC to be a large operation in terms of aircraft and operations. Operators are classified as "10 or more" or "9 or less" [number of people the airplane held] If there were any safety concerns, they can add oversight to the "9 or less" carriers. Concerns could include high turnover of management, decrease in Part 119 personnel, financial difficulties, or increase in accident/incident rate. If the FAA increased surveillance above the minimum requirements, they "must be able to justify the resources." As of this interview, they [FAA] "have not increased any formal oversight, but will reassess when the accident report comes out."

FAA Oversight protocols in the SAS were included in FAA Order 8900.1 CHG 270, Volume 6, Surveillance, Chapter 2 Part 121, 135, and 91 Subpart K: Inspections (Section 9: Safety Assurance System: Cockpit Enroute Inspections)[31] and stated, in part:

> *The primary objective of cockpit enroute inspections is for an inspector to observe and evaluate the in-flight operations of a certificate holder within the total operational environment of the air transportation system. Enroute inspections are one of the Federal Aviation Administration's (FAA) most effective methods of accomplishing its air transportation surveillance objectives and responsibilities. These inspections provide the FAA with an opportunity to assess elements of the aviation system that are both internal and external to an operator.*

[31] Flight Standards Information Management System (FSIMS) Order 8900.1. http://fsims.faa.gov/PICResults.aspx?mode=EBookContents&restricttocategory=all~menu

Inspectors should consider all inspection areas, both internal and external to the operator, to be of equal importance. Four general inspection areas have been identified for observation and evaluation by inspectors during enroute inspections. All inspection areas may not be assessed during each enroute inspection.

- *Crewmember,*
- *Flight conduct,*
- *Airport/heliport, and*
- *ATC/airspace.*

4.7 Safety Program / Safety Management System (SMS)

A safety program is a formal and document program that addresses safety within the company on a holistic level.

According to the FAA, SMS[32] manages safety on a systemic level from the top down and filters to the rest of the organization then back up to close the circle. SMS has the necessary, policies, procedures tools and infrastructure to allow for the identification of safety issues and subsequent remediation's.

The four components of SMS include.

1. Safety Policy
2. Safety Promotion
3. Safety Risk Management
4. Safety Assurance

While ACC does not have a formal and documented SMS or a documented safety program that utilizes safety management principles and components, Safety is documented in Section 6.2 of the company's FOM set for the policy and procedures for safety management:

1. It is the intention and policy of the Company to establish and operate with the highest safety standards. Employees must operate within the scope of all Company policies and Federal Aviation Regulations.

2. All supervisory personnel shall enforce a basic policy of safety being the top priority in all operations. All ground and flight equipment is to be kept in good operating condition. Safety shall be promoted through personnel training, and the use of sound judgement in all operations.

In addition, Section 10.17 of the company's FOM described procedures for the submittal of the multi-use reporting form which communicates mechanical irregularities, NTSB Information, Customer

[32] Development and implementation of an SMS at a part 135 operator is voluntary only. Guidance for SMS could be found in the FAA Advisory Circular (AC) 120-92B Safety Management Systems for Aviation Service Providers. The AC did not constitute a regulation nor is it a requirement.

Service Issues, Delays, Mechanical Reliability, Irregularities, Abnormalities or "Safety of flight information gathered by a crew. This item would need to be initiated by the crew."

The multi-use form was the only documented means to report safety issues. There is no dedicated safety confidential safety reporting program, or an Aviation Safety Action Program (ASAP)[33]; safety issues would be shared via a multi-use form or via a phone call. The safety program consists of a "see something, say something" protocol and was normally done with a phone call to the Chief Pilot. According to the Chief Pilot, when asked if ACC had any formal means of reporting safety, he replied "no" however, "the company encourages them to report safety issues." According to the Chief Pilot, this is not written anywhere, but it is encouraged during training. There is no documented process to track and analyze safety reports from the pilots. When queried about what kind of safety issues are reported and how many have been received over the past year, he responded that there are no methods in place.

In lieu of a formal internal evaluation program, operational oversight consisted of irregular/nonscheduled chief pilot line flying when filling in for a sick or absent crew member; this would allow him to observe operations in the field. There was no "initial operating experience (IOE)" type of program. The chief pilot stated he would check in with new hire pilots after the first week on the job to see how they were doing and answer any questions. This follow-up was not conducted with the accident First Officer. He stated that the most challenging part of his job was managing from afar since he could not see the attitudes and demeanors of his pilots. He stated he assumed that if a pilot was having difficulties that they will reach out. They did not solicit feedback regarding how crews were working together at the base.

5.0 Airplane

Photo 1. Photograph of accident airplane N334AC[34]

The accident airplane, registration N334AC, serial number SH3029, was a Shorts Brothers and Harland SD3-30 fixed wing multi engine Pratt & Whitney turbo-prop airplane with Hartzell 5

[33] The goal of the Aviation Safety Action Program (ASAP) is to enhance aviation safety through the prevention of accidents and incidents. Its focus is to encourage voluntary reporting of safety issues and events that come to the attention of employees of certain certificate holders. Source: 8000.82, Designation of Aviation Safety Action Program (ASAP) and (AC) 120-66.

[34] Photograph captured from internet search/Permission for use granted by photographer Kim Philipp Piskol.

blade propellers. It was built in 1979. It was registered to ACC Integrated Services Inc. The accident airplane was built in 1979 and was issued its most recent Standard Airworthiness Certificate on December 17, 1998. The airplane was converted to a cargo airplane in December 1998. Prior to the accident flight, the airplane had accrued 28,023.2 hours and 36,738 cycles. The airplane was not equipped, nor was it required to be equipped with a cockpit voice recorder (CVR) or flight data recorder (FDR).[35]

5.1 Cockpit Instrumentation

Each pilot position was equipped with an horizontal situation indicator (HSI) and an Attitude Director Indicator (ADI) as part of the instrument panel. Each ADI presented a 3-dimensional display of airplane attitude and flight control system steering commands, localizer deviation, glideslope deviation, rate-of-turn, radio altitude, and decision height in a standard T-formation. Each HSI was mounted immediately below the ADI, and presented a plan view of the airplane's horizontal situation. HIS information displayed included indicated heading, selected heading, VOR or localizer course and deviation, RNAV course and deviation, to/from information and turn/bank indication mounted directly below the unit. The operations group observed an exemplar airplane located in ACC hanger to derive following photographs.[36]

Photo 2. Captain's instrumentation exemplar airplane.

[35] For more information see the Airworthiness Group Chairman's Factual Report.
[36] ACC Exemplar airplane Shorts SD3-30 (N2629P).

Photo 3. First officer's instrumentation exemplar airplane.

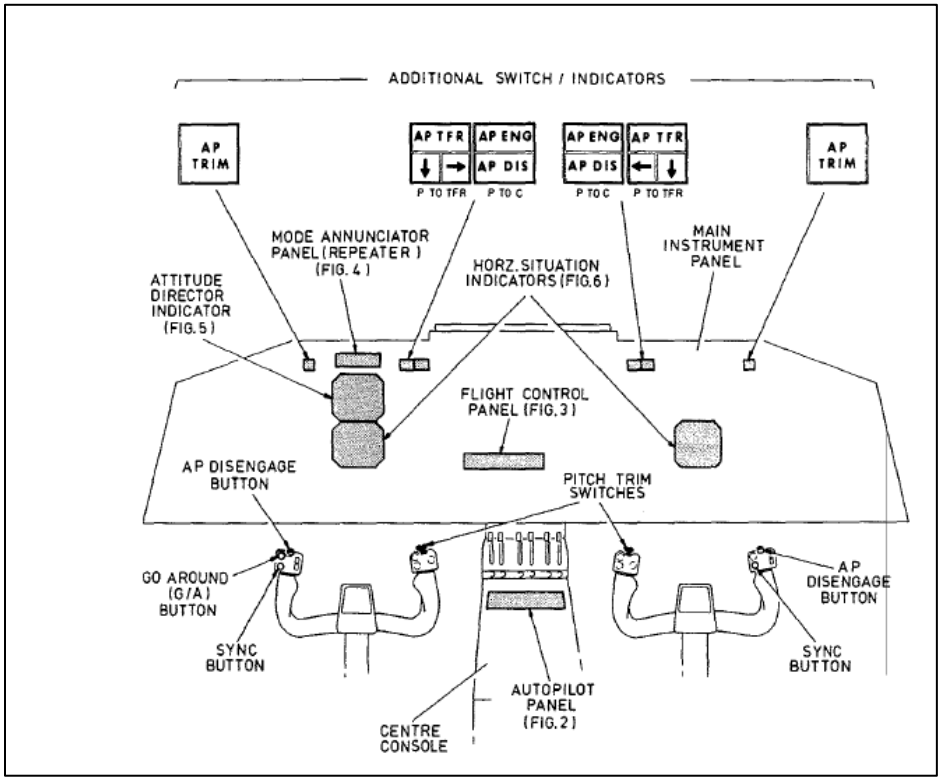


Figure 1. Instrumentation and switch Layout; Shorts crew manual 2-02A, page 3.

Photo 4. Captain's post-accident instrumentation.

Photo 5. First Officer post-accident instrumentation.

Photo 6. Flap handle location[37].

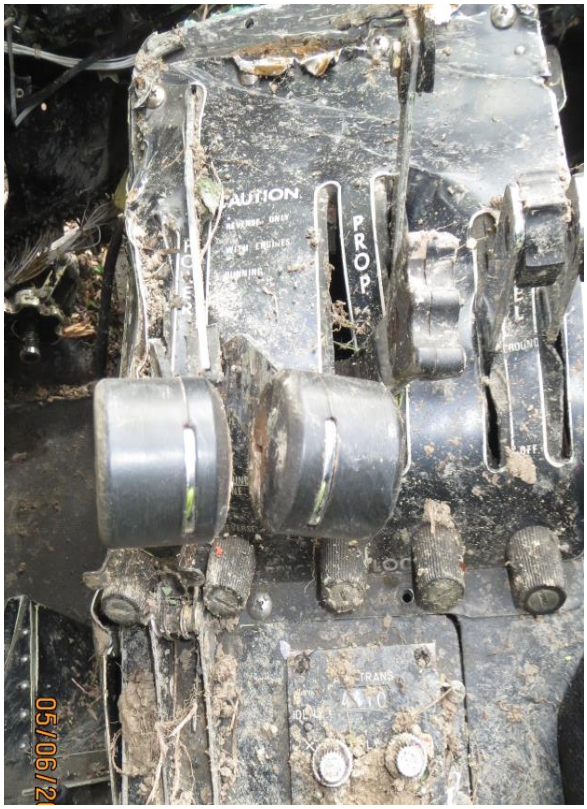


Photo 7. Power/Prop/Fuel.

[37] Note: Photographs taken after fire/rescue personnel departed the cockpit.

Photo 8. Captain altimeter post-accident.

Photo 9. First Officer altimeter post-accident.

6.0 Weather

A Safety Board meteorologist obtained weather information during the investigation from the National Weather Service, as well as from the National Climatic Data Center[38] CRW was located 3 miles east of Charleston, West Virginia. KCRW had an Automated Surface Observing System (ASOS[39]).

> [0303 EDT] SPECI KCRW 050703Z 07007KT 7SM RA FEW001 SCT031 OVC055 14/13 A2950 RMK AO2 VLY FG P0000 T01440133 $=
>
> [0448 EDT] SPECI KCRW 050848Z 10003KT 6SM -RA BR SCT004 BKN021 OVC048 14/13 A2947 RMK AO2 VLY FG P0004 $=
>
> [0454 EDT] METAR KCRW 050854Z 13003KT 6SM -RA BR SCT004 BKN021 OVC048 14/13 A2947 RMK AO2 SLP974 VLY FG P0004 60023 T01390133 56013 $=
>
> [0546 EDT] SPECI KCRW 050946Z 06010KT 10SM SCT007 BKN013 OVC031 14/13 A2940 RMK AO2 RAE46 PRESFR P0001 T01390133 $=[40]
>
> ***[0554 EDT] METAR KCRW 050954Z 08011KT 10SM SCT007 BKN013 OVC031 14/13 A2938 RMK AO2 RAE46 PRESFR SLP943 P0001 T01390133 $=***
>
> ***[0630 EDT] SPECI KCRW 051030Z 17004KT 10SM FEW001 OVC005 14/13 A2940***

[38] Refer to Meteorology factual report for more detailed information and data
[39] ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dewpoint, altimeter, and barometric pressure.
[40] 65 minutes to accident

RMK AO2 VLY FG T01390133 $=

ACCIDENT TIME 0651 EDT

[0654 EDT] METAR KCRW 051054Z 23003KT 10SM FEW001 OVC005 14/13 A2941 RMK AO2 SLP952 VLY FG T01440133= [41]

[0659 EDT] SPECI KCRW 051059Z 00000KT 10SM FEW001 OVC005 14/13 A2940 RMK AO2 T01440133=

[0744 EDT] SPECI KCRW 051144Z 20003KT 10SM FEW000 SCT011 BKN060 15/14 A2943 RMK AO2 FG FEW000 T01500139=

[0754 EDT] METAR KCRW 051154Z 00000KT 10SM FEW000 SCT011 BKN060 16/14 A2942 RMK AO2

CRW weather at 0554, wind from 080° at 11 knots, 10 statute miles visibility, scattered clouds at 700 ft above ground level (agl), broken ceiling at 1,300 ft agl, overcast skies at 3,100 ft. agl, temperature of 14° Celsius (C), dew point temperature of 13° C, and an altimeter setting of 29.38 inches of mercury (inHG). Remarks, station with a precipitation discriminator, rain ended at 0546, pressure falling rapidly, sea level pressure 994.3 hPa, one-hourly precipitation of 0.01 inches, temperature 13.9° C, dew point temperature 13.3° C, maintenance is needed on the system.

CRW weather at 0630, wind from 170° at 4 knots, 10 statute miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.40 inHG. Remarks, station with a precipitation discriminator, valley fog, temperature 13.9° C, dew point temperature 13.3° C, maintenance is needed on the system.

CRW weather at 0654, wind from 230° at 3 knots, 10 statute miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.41 inHG. Remarks, station with a precipitation discriminator, sea level pressure 995.2 hPa, valley fog, temperature 14.4° C, dew point temperature 13.3° C.

CRW weather at 0659, wind calm, 10 statute miles visibility, few clouds at 100 ft agl, overcast ceiling at 500 ft agl, temperature of 14° C, dew point temperature of 13° C, and an altimeter setting of 29.40 inHG. Remarks, station with a precipitation discriminator, temperature 14.4° C, dew point temperature 13.3° C.

CRW dropped from 1,300 ft agl to 500 ft agl, between 0625 and 0630. The CRW ASOS cloud ceilometer observed the cloud ceiling as a broken cloud ceiling at 500 ft. agl at 0628:04 (attachment 1), but when the official weather observer viewed the weather conditions, they edited the METAR line and changed the broken cloud ceiling at 500 ft agl to an overcast cloud ceiling at 500 ft agl. In addition, the official weather observer added a few clouds at 100 ft. agl and "valley fog" to the official 0630 EDT transmitted KCRW SPECI (attachment 1). Once the ASOS METAR

[41] Accident time plus 4 minutes

or SPECI is transmitted from the ASOS, the METAR or SPECI is automatically sent to the ATC tower's Operator Interface Device (OID).

The observations from CRW surrounding the accident time indicated a surface wind under 5 knots with IFR[42] ceiling conditions with valley fog.

7.0 Witness to Airplane on Approach

During the course of the investigation, a local attorney and pilot, was departing [driving] out of his neighborhood about 2 miles east of the approach end of runway 5 on a magnetic heading of approximately 265 degrees. As he was driving down the hill, he saw the accident airplane flying towards him on an easterly heading. He stated, "it was a beautiful sight" the airplane was "hugging" the bottom of the clouds, "just grazing the bottom of the cloud or fog deck." He stated he saw the landing lights and the shadow of the airplane perfectly as it headed towards him, then it passed directly overhead. He thought the airplane was on the VOR-Alpha approach. He stated, he realized when he got to the office that it was the accident airplane.

Photo 10. Witness location and flight track of airplane.

[42] Instrument Flight Rules – Refers to the general weather conditions pilots can expect at the surface. IFR criteria means a ceiling below 1,000 ft. agl and/or less than 3 miles visibility.

Photo 11. Witness location in relation to airport.

8.0 Weight and Balance

The chart below provides a column for the weight and balance information provided by ACC and corroborated by documentation and data. ACC's Weight and Balances procedures were detailed in the FOM dated November 20, 2009, Chapter 16. The table below shows the weights of the accident airplane. The weight and balance and CG was within limits[43].

Table 1. Weights of the Accident Airplane.

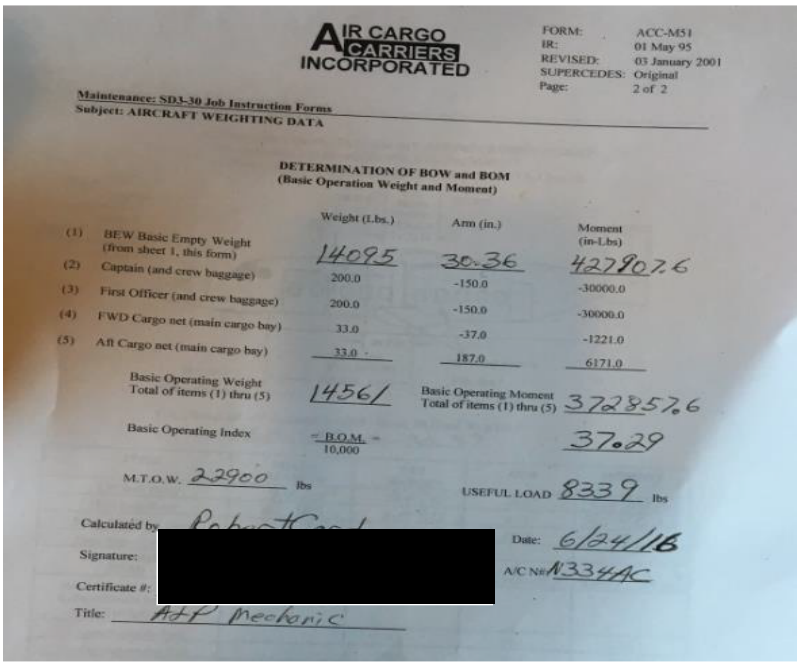
Specific Item	Weight	ARM	Moment
Basic Operating Weight (BOW)	14,561	25.6	372857.6
Baggage Weight	In BOW		
Zero Fuel Weight	14561	25.6	372857.6
Maximum Zero Fuel Weight	Null		
FWD Cargo net (main Cargo bay)	In BOW		
Aft Cargo net (main cargo bay)	In BOW		
Fuel Weight	3000 + 3874 Cargo		
Ramp Weight	21453		
Maximum Ramp Weight	23000		
Estimated Taxi Burn	(-) 100		
Estimated Takeoff Weight	21335		

[43] Shorts SD 3-30 Crew Manual Section 3, Weight & CG Limitations.

Maximum Takeoff Weight	22900		
Maximum Structural Takeoff	22900		
Takeoff CG Limits (per Airplane Flight Manual)	17.2 - 35		
Takeoff Center of Gravity (CG)	31		
Estimated Fuel Burn	1200		
Estimated Landing Weight	20153		
Maximum Landing Weight[44]	22600		
Landing CG Limits	17 - 35		
Landing CG	31		
VREF99 Flaps 35	92		
VAPP	120		

8.1 Aircraft Weight Data

The determination of the BOW and BOM [45] was from Form- ACC-M51, recovered at the accident site.



AIR CARGO CARRIERS INCORPORATED

FORM: ACC-M51
IR: 01 May 95
REVISED: 03 January 2001
SUPERCEDES: Original
Page: 2 of 2

Maintenance: SD3-30 Job Instruction Forms
Subject: AIRCRAFT WEIGHTING DATA

DETERMINATION OF BOW and BOM
(Basic Operation Weight and Moment)

	Weight (Lbs.)	Arm (in.)	Moment (in-Lbs)
(1) BEW Basic Empty Weight (from sheet 1, this form)	14095	30.36	427907.6
(2) Captain (and crew baggage)	200.0	-150.0	-30000.0
(3) First Officer (and crew baggage)	200.0	-150.0	-30000.0
(4) FWD Cargo net (main cargo bay)	33.0	-37.0	-1221.0
(5) Aft Cargo net (main cargo bay)	33.0	187.0	6171.0
Basic Operating Weight Total of items (1) thru (5)	14561	Basic Operating Moment Total of items (1) thru (5)	372857.6
Basic Operating Index = B.O.M. / 10,000			37.29

M.T.O.W. 22900 lbs
USEFUL LOAD 8339 lbs

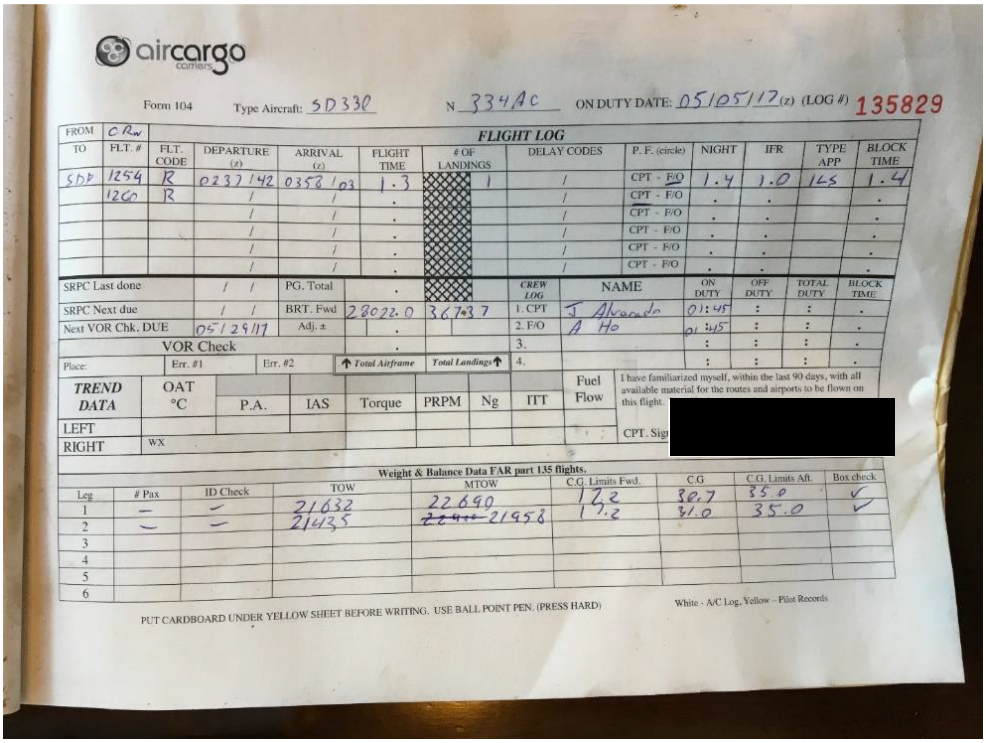
Calculated by: [redacted]
Signature:
Certificate #:
Title: A&P Mechanic
Date: 6/24/16
A/C N#: N334AC

Photo 12. BOW and BOM Weight Data for accident airplane

8.2 Flight Logbook and data from accident flight from SDF to CRW

[44] Shorts SD3-30 Crew manual Weight and CG Limitations.
[45] Basic Operating Weight and Basic Operating Moment respectively.

The accident aircraft logbook (Ops Form 104) was recovered on scene. A review of the last page of logbook entries indicated completed entries for the CRW to SDF leg and the beginning entry of the accident flight.



aircargo carriers

Form 104 Type Aircraft: SD330 N 334AC ON DUTY DATE: 05/05/17 (z) (LOG #) 135829

FLIGHT LOG

FROM	TO	FLT. #	FLT. CODE	DEPARTURE (z)	ARRIVAL (z)	FLIGHT TIME	# OF LANDINGS	DELAY CODES	P. F. (circle)	NIGHT	IFR	TYPE APP	BLOCK TIME
CRW	SDF	1254	R	0237/42	0358/03	1.3	1	/	CPT - F/O	1.4	1.0	ILS	1.4
SDF		1260	R	/	/	.		/	CPT - F/O	.	.		.
				/	/	.		/	CPT - F/O	.	.		.
				/	/	.		/	CPT - F/O	.	.		.
				/	/	.		/	CPT - F/O	.	.		.
				/	/	.		/	CPT - F/O	.	.		.

SRPC Last done	/ /	PG. Total	.		CREW LOG	NAME	ON DUTY	OFF DUTY	TOTAL DUTY	BLOCK TIME
SRPC Next due	/ /	BRT. Fwd	28022.0	36737	1. CPT	J Alvarado	01:45	:	:	.
Next VOR Chk. DUE	05/29/17	Adj. ±	.		2. F/O	A Ho	01:45	:	:	.
VOR Check			.		3.		:	:	:	.
Place:	Err. #1	Err. #2	↑ Total Airframe	Total Landings ↑	4.		:	:	:	.

TREND DATA	OAT °C	P.A.	IAS	Torque	PRPM	Ng	ITT	Fuel Flow
LEFT								
RIGHT	WX							

I have familiarized myself, within the last 90 days, with all available material for the routes and airports to be flown on this flight.

CPT. Sig [redacted]

Weight & Balance Data FAR part 135 flights.

Leg	# Pax	ID Check	TOW	MTOW	C.G. Limits Fwd.	C.G	C.G. Limits Aft.	Box check
1	—	✓	21632	22690	17.2	38.7	35.0	✓
2	—	✓	21435	~~22490~~ 21958	17.2	41.0	35.0	✓
3								
4								
5								
6								

PUT CARDBOARD UNDER YELLOW SHEET BEFORE WRITING. USE BALL POINT PEN. (PRESS HARD)

White - A/C Log, Yellow - Pilot Records

Photo 13. Accident flight log form 104 discovered at accident site. See attachments for additional logs

8.3 Accident Flight Clipboard with Times, Fuel and Weight

A clipboard for the initial and accident flight was discovered in the wreckage. It shows fueling of 185 gallons, cargo weight of 3,874 pounds of which 80% is bulk and a loading completed time of 0525.

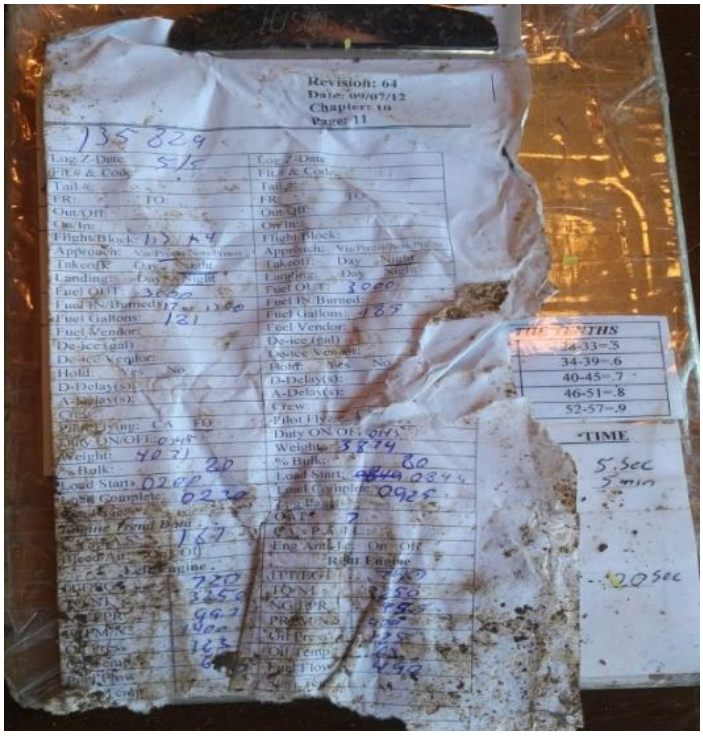


Photo 14. Flight clipboard with times, fuel and weight discovered at accident site

8.4 Placards In Aircraft Logbook "Can"[46]

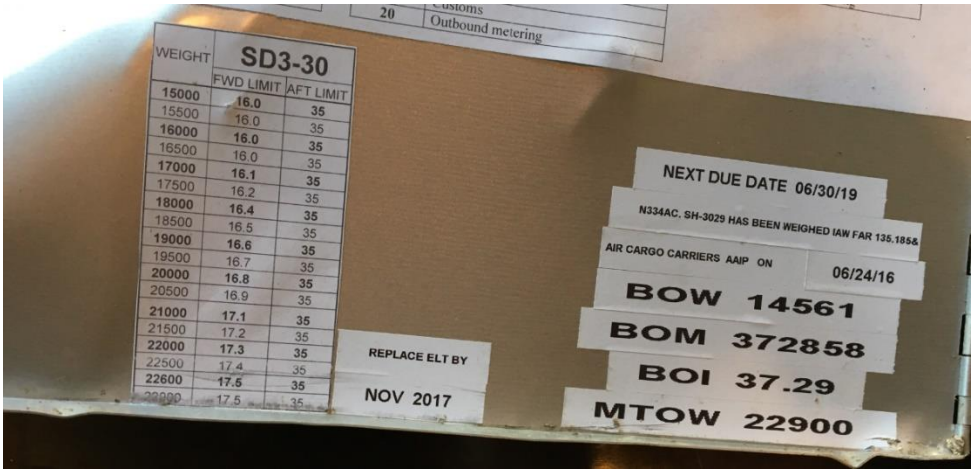
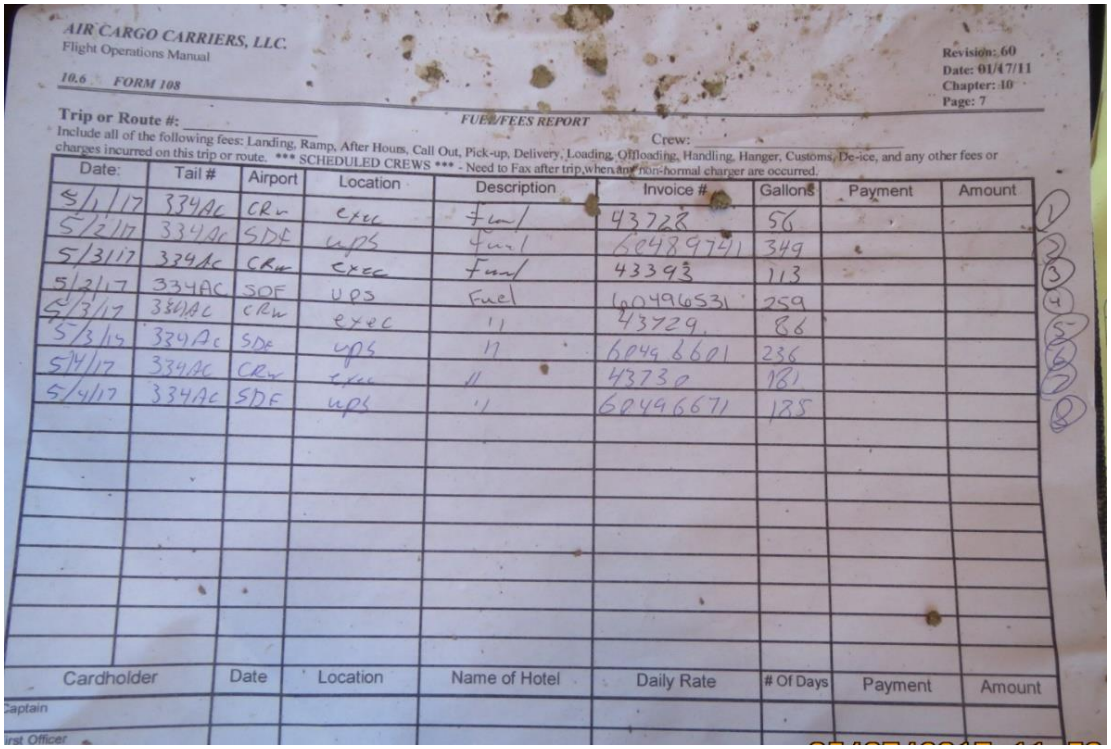


Photo 15. Placards in aircraft logbook "can" discovered at accident site

9.0 Fuel

According to the ACC Flight Operations Form 108 Fuel/Fees page discovered at the accident site, there are 8 entries on the page that show fueling records starting on May 1, 2017. The last entry on the page is dated May 4, 2017; The airplane received 185 gallons in SDF.

[46] Can is an aluminum logbook and paperwork container.



AIR CARGO CARRIERS, LLC.
Flight Operations Manual
10.6 FORM 108
Revision: 60
Date: 01/47/11
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Page: 7

Trip or Route #: _____ FUEL/FEES REPORT Crew: _____

Include all of the following fees: Landing, Ramp, After Hours, Call Out, Pick-up, Delivery, Loading, Offloading, Handling, Hanger, Customs, De-ice, and any other fees or charges incurred on this trip or route. *** SCHEDULED CREWS *** - Need to Fax after trip,when any non-normal charges are occurred.

Date:	Tail #	Airport	Location	Description	Invoice #	Gallons	Payment	Amount
5/1/17	334AC	CRW	exec	Fuel	43728	56		
5/2/17	334AC	SDF	UPS	Fuel	6048974/1	349		
5/3/17	334AC	CRW	exec	Fuel	43393	113		
5/3/17	334AC	SDF	UPS	Fuel	6049653/	259		
5/3/17	334AC	CRW	exec	"	43729	86		
5/3/17	334AC	SDF	UPS	"	6049660/	236		
5/4/17	334AC	CRW	exec	"	43730	181		
5/4/17	334AC	SDF	UPS	"	6049667/	185		

Cardholder	Date	Location	Name of Hotel	Daily Rate	# Of Days	Payment	Amount
Captain							
First Officer							

Photo 16. ACC FOM Fuel/Fees Report discovered at accident site

According to ACC Dispatch, on the day of the accident, the airplane received 181 gallons of fuel for the CRW-SDF flight and on the accident flight from SDF to CRW, the airplane received 185 gallons prior to departure from SDF.

10.0 Airport Information[47]

Yeager Airport (CRW) Charleston, West Virginia was located about 3 miles east of Charleston, West Virginia, at an elevation of 946 ft msl, and at a latitude/longitude of decimal degrees 38.3759291 and -81.5930039. The airport has an FAA Air Traffic Control Tower.

FAA Identifier: CRW
Lat/Long: 38-22-33.3446N / 081-35-34.8140W
38-22.555743N / 081-35.580233W
38.3759291 / -81.5930039
(estimated)
Elevation: 947.2 ft. / 288.7 m (surveyed)
Variation: 06W (1985)
From city: 3 miles E of CHARLESTON, WV
Time zone: UTC -5 (UTC -4 during Daylight Saving Time)
Zip code: 25311

10.1 Runway Information

Runway 5/23 Dimensions: 6802 x 150 ft. / 2073 x 46 m

[47] Attachment 8: See CRW Airport Charts for detailed information. Source: Airnav

Surface:	asphalt/grooved, in good condition	
Weight bearing capacity:	PCN 39 /F/B/X/U Single wheel: 120.0 Double wheel: 160.0 Double tandem: 260.0	
Runway edge lights:	high intensity	
	RUNWAY 5	**RUNWAY 23**
Latitude:	38-22.174667N	38-22.936833N
Longitude:	081-36.102000W	081-35.058500W
Elevation:	946.1 ft.	894.4 ft.
Gradient:	0.9%	0.9%
Traffic pattern:	left	left
Runway heading:	053 magnetic, 047 true	233 magnetic, 227 true
Displaced threshold:	577 ft.	500 ft.
Declared distances:	TORA:6802 TODA:6802 ASDA:6302 LDA:5725	TORA:6802 TODA:6802 ASDA:6302 LDA:5802
Markings:	precision, in good condition	precision, in good condition
Visual slope indicator:	4-box VASI on left (3.00 degrees glide path) VASI RY 05 NOT COINCIDENT WITH ILS GS.	4-box VASI on right (3.00 degrees glide path)
RVR equipment:	touchdown	touchdown
Approach lights:		ALSF1: standard 2,400 foot high intensity approach lighting system with centerline sequenced flashers (category I)
Runway end identifier lights:	yes	
Centerline lights:	yes	yes
Touchdown point:	yes, no lights	yes, no lights
Instrument approach:	ILS/DME	ILS/DME
Obstructions:	223 ft. pole, lighted, 3950 ft. from runway, 950 ft. right of centerline, 16:1 slope to clear	136 ft. pole, lighted, 4300 ft. from runway, 100 ft. left of centerline, 30:1 slope to clear

The accident occurred as the airplane was approaching runway 5 at CRW. CRW had two runways; runway 5/23. The Runways, had an asphalt surface, and was 6,802 feet long and 150 feet wide.

11.0 NOTAMS

!FDC 7/9923 CRW IAP YEAGER, Charleston, WV.
RNAV (GPS) Y RWY 23, AMDT 1A...
LPV MINIMUMS NA.
1704131650-1711231650EST
!CRW 08/044 CRW RWY 5 THR DISPLACED 578FT. DECLARED DISTANCES: TORA 6802FT TODA 6802FT
ASDA 6302FT LDA 5724FT. 1508111752-1708151600
!CRW 08/077 CRW RWY 23 ENGINEERED MATERIALS ARRESTING SYSTEM OUT OF SERVICE 1508191524-1708151600
!CRW 12/043 CRW RWY 05/23 SAFETY AREA NOT STD 1512221324-1708151600
!CRW 07/075 CRW RWY 5 VASI OUT OF SERVICE 1507271200-1707272000
!CRW 07/074 CRW RWY 5 RWY END ID LGT OUT OF SERVICE1507271200-1707272000
!CRW 07/073 CRW NAV ILS RWY 5 GP OUT OF SERVICE 1507271200-1707272000

!CRW 05/016 CRW OBST TOWER LGT (ASR 1054162) 381625.00N0813126.00W (6.9NM SSE CRW)
1753.0FT (273.0FT AGL) OUT OF SERVICE 1705022007-1706302000
!CRW 02/046 CRW OBST TOWER LGT (ASR 1035682) 382424.00N0814237.00W (5.8NM WNW CRW)
1304.8FT (204.1FT AGL) OUT OF SERVICE 1702280245-1706061700
!CRW 02/047 CRW OBST TOWER LGT (ASR 1035689) 383635.00N0813543.00W (14.1NM NE CRW)
1319.9FT (220.1FT AGL) OUT OF SERVICE 1702280246-1706061700
!CRW 05/021 CRW OBST TOWER LGT (ASR 1264714) 381554.60N0814633.00W (11.0NM SW CRW)
1265.4FT (307.7FT AGL) OUT OF SERVICE 1705050656-1706051200
!CRW 05/020 CRW OBST TOWER LGT (ASR 1281717) 382931.60N0811918.60W (14.6NM ENE CRW)
1184.1FT (309.1FT AGL) OUT OF SERVICE 1705050359-1706041200
!CRW 05/019 CRW OBST TOWER LGT (ASR 1208851) 382459.30N0813225.90W (3.5NM NE CRW)
1215.9FT (165.0FT AGL) OUT OF SERVICE 1705031802-1706031802
!CRW 05/009 CRW OBST TOWER LGT (ASR 1256656) 382811.00N0814237.50W (7.8NM NW CRW)
1338.9FT (361.9FT AGL) OUT OF SERVICE 1705020229-1706011200
!CRW 04/054 CRW OBST TOWER LGT (ASR 1032141) 382453.00N0814827.00W (10.3NM WNW CRW)
1318.9FT (295.9FT AGL) OUT OF SERVICE 1704300752-1705300752
!CRW 05/010 CRW OBST TOWER LGT (ASR 1234650) 383011.40N0815106.70W (14.2NM WNW CRW)
872.0FT (180.1FT AGL) OUT OF SERVICE 1705020427-1705170327
!CRW 04/052 CRW OBST TOWER LGT (ASR 1285788) 382820.90N0815132.00W (13.7NM WNW CRW)
1182.7FT (308.1FT AGL) OUT OF SERVICE 1704291458-1705141458
!CRW 04/046 CRW OBST TOWER LGT (ASR 1244229) 381642.90N0814913.10W (12.3NM WSW CRW)
1336.0FT (268.0FT AGL) OUT OF SERVICE 1704270619-1705120519
!CRW 05/025 CRW AD AP CLSD EXC MIL, POLICE OR MEDEVAC HEL OPS ON TWY B BTN TWY B1
AND
TWY B4 1705051552-1705071551
!FDC 7/0940 CRW IAP YEAGER, Charleston, WV.
LOC RWY 5, ORIG...
MISSED APPROACH: CLIMB TO 1800 THEN CLIMBING LEFT TURN TO 4000 DIRECT HNN VORTAC
AND
HOLD. RADAR REQUIRED FOR PROCEDURE ENTRY EXCEPT FOR AIRCRAFT EQUIPPED WITH
SUITABLE
RNAV SYSTEM WITH GPS,
HVQ VOR OUT OF SERVICE. 1705051355-1705121355EST
!FDC 7/0938 CRW IAP YEAGER, Charleston, WV.
ILS OR LOC RWY 23, AMDT 30A...
MISSED APPROACH: CLIMB TO 2500 THEN CLIMBING RIGHT TURN TO 4000 DIRECT HNN VORTAC
AND
HOLD,
HVQ VOR OUT OF SERVICE. 1705051355-1705121355EST
PDF generated by Federal NOTAM Systems on: 2017-05-08 17:07:21 UTC Page 1 of 2
!CRW 05/024 CRW AD AP CLSD EXC HEL OPS ON TWY B BTN TWY B1 AND TWY B4
1705051451-1705061451
!CRW 05/022 CRW AD AP CLSD 1705051128-1705061127
!CRW 05/014 CRW OBST TOWER LGT (ASR 1223182) 382800.10N0813935.50W (6.3NM NNW CRW)
1277.6FT (285.8FT AGL) OUT OF SERVICE 1705021554-1706021200

12.0 The Approach(s)

CRW was advertising the localizer runway 5 approach. ACC Flight SNC1260, herein referred to as SNC1260 requested the VOR-A approach to runway 5. The accident flight was executing the VOR-A runway 5 non-precision approach at CRW. The localizer was tuned by setting the CRW VORTAC (HVQ) channel frequency to 117.4 and setting the approach course, utilizing the HSI course selector knob to 084°

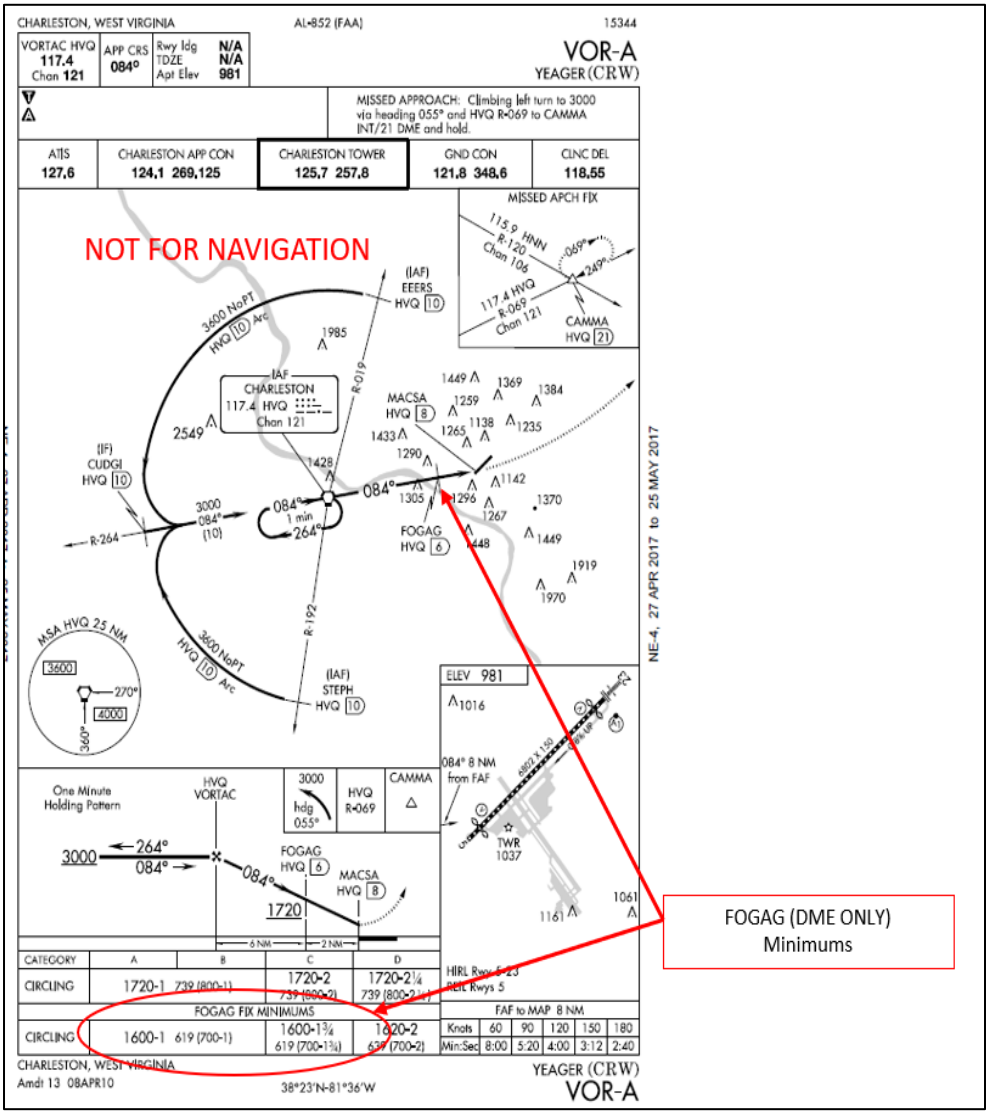


Figure 2. VOR-A approach chart and notations (red lines and circles showing FOGAG Fix and Minimums)

12.1 Video of Approach

Video[48] from several cameras, one located west southwest of the airport on top of a Charleston garage building and two cameras located on the airport terminal building, show the airplane in various stages of the approach. The airport terminal building cameras capture the final approach and runway impact. The airport entry camera shows SNC1260, with landing lights illuminated descending in a non-standard nose down attitude and making a left turning roll in an attempt to line up with runway 5 before it disappears out of the camera frame. The airport tower/building camera shows SNC1260 striking runway 5 in while in a left bank and approximately 11 º nose down pitch in reference to the runway; the airplane struck the runway with the left wing followed

[48] See video study factual for more details.

by the left side of the fuselage; it slid off the left side of the runway into the grass and down a hill through trees.

The Charleston garage building camera video shows SNC1260 descend out of the clouds parallel to the camera then heading towards the airport (away from the camera) before disappearing out of view behind terrain and trees. On the video, at 6:52:18[49], the airplane descends out of the clouds.

At 6:52:36, the airplane appears to start a left turn. At 6:52:41, the airplane disappears behind terrain and trees. The accident sequence cannot be seen in this video.

12.2 Non-Precision Approach

According to the ACC Standard Operating Procedures manual dated November 20, 2009, chapter 6 page 14, during a non-precision approach, Shorts SD3 pilots were provided the following guidance.

1. The recommended power settings will change for any approach, but initial guidelines would be:
Level Flight - Tq 2000/1400 RPM - 140-145 kts.
Descending - Tq 1500/1400 RPM - 140-145 kts.
Final - Tq 1000/1675 RPM - 110-120 kts.

2. The descent checklist shall commence prior to leaving initial cruising altitude and shall be completed no later than arrival at the Initial approach altitude (outside the I.A.F.). Upon approaching the F.A.F., set torque approximately 1500 lbs. (descent) or 2000 lbs. (level), props 1400 & airspeed 140 Kts. All navaids will be identified.

3. At the initial fix reduce torque to 2000 and allow the speed to settle at 140-145 kts.

4. Any descent in the procedure prior to the FAF should be made at Tq 1500 and 140-145 kts. When
leveling off anticipate the resetting of torque to avoid speed loss.

5. At approximately 3 miles prior to FAF, procedure turn inbound or vector to intercept final, call ***"Flaps Approach, gear down, Approach Checks."***

6. Just prior to the FAF (approx. 1 mile), set Torque 1000, and call ***"Flaps 15, Final Checks, my power".*** *Lower the nose to maintain descent and decrease speed to Vref + 10. Rate of descent and power required will depend on wind conditions, so make minor power and attitude changes to*
maintain the required descent and speed.

7. Call for ***"Flaps Full"*** *once landing is assured, and a normal landing can be made. Maintain the*
correct glidepath after MDA using VASI if available. Do not fly below the VASI.

[49] Charleston garage video was not correctly synched with actual time.

*8. The PNF should call **"Final Checks complete"** after the flaps are set to full for a full flap landing.*

9. If visual contact is not established at MAP initiate the missed approach using the normal go-around procedure.

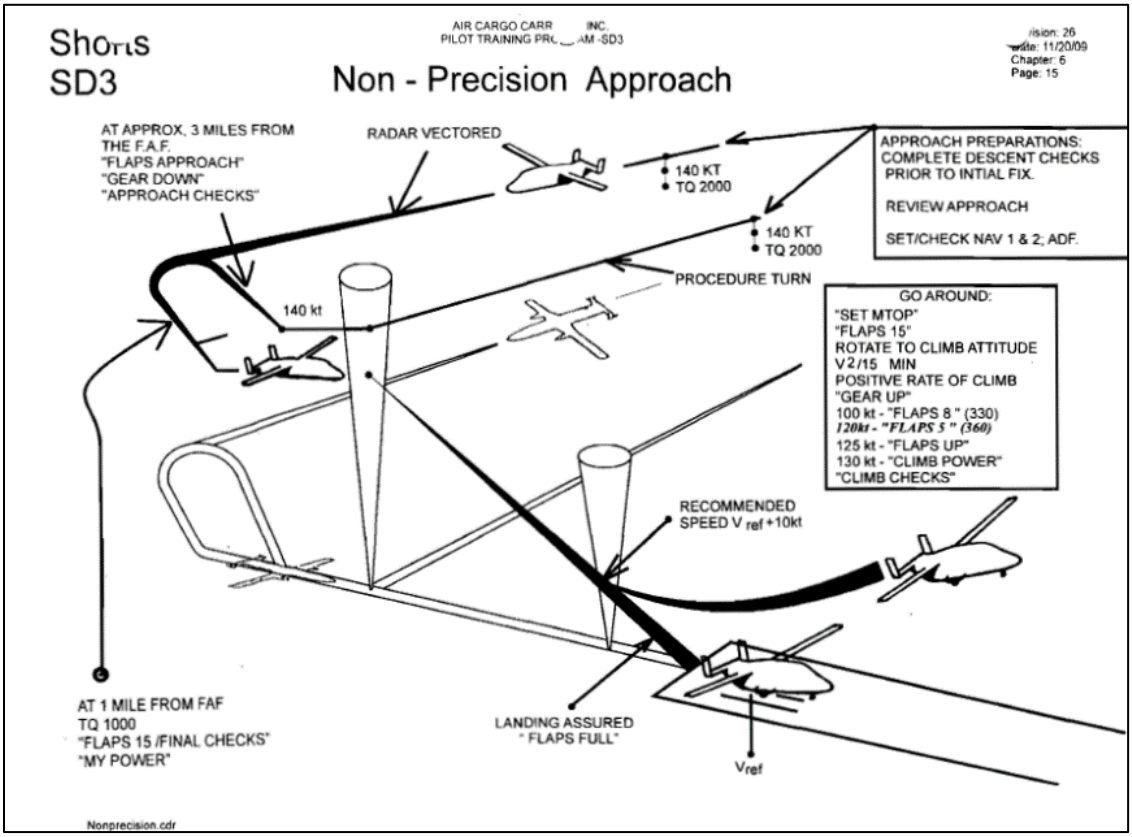


Figure 3. Non-precision approach guidance.

12.3 Circling Instrument Approach

The ACC SD3 Pilot Training Program, dated November 20, 2009, Chapter 4, page 22 states the following in part:

> *The approach is accomplished in the same manner as other approaches up to reaching MDA and the crew has visual contact with the runway. An airspeed of Vref + 20 (not to exceed 120 KIAS – Cat B) and MDA will be maintained throughout the approach until on glidepath. Once on the glidepath, adjust power and call for landing flaps to maintain proper glidepath and Vref +10. Cross the threshold at Vref.*
>
> *Visual reference with the runway environment at MDA must be maintained throughout the entire approach and at no time should bank exceed 30 degrees. If the turn is on the side of the non-flying pilot, he will maintain visual contact with the airport and the flying pilot will maintain VMC conditions at the MDA. Visual maneuvering at MDA will be accomplished within a distance equal to circling minima criteria for the approach.*

NOTE 2: Within one mile of the airport the aircraft shall not be banked more than 30degrees, Vref allowed to exceed ref + 15 and have a descent rate in excess of 1000 ft. per min. If any of these
conditions exist the flying pilot shall execute a go-around.

12.4 Circling to land

Per the ACC Standard Operating Procedures (SOP) Pilot Training Program[50], "A circling approach should be made when an instrument approach procedure does not permit a straight in landing to the active runway." Once visual contact with runway 5 was established, the airplane is to be leveled with the airspeed maintained at 120 kts and torque values about 1500-2000 lbs. Pilots should turn onto base leg using up to 30 ° bank until an intercept to a normal final approach and landing can be made, using a normal 2.5 to 3 ° glidepath, holding a speed of Vref +10 kts on final.

Photo 17. ACC V-Speed cards discovered at the accident site.

13.0 Stabilized Approach

FAA AC 120-108[51] states a stabilized approach by "maintaining a stable approach speed, descent rate, vertical flightpath, and configuration to the landing touchdown point. Depart the final approach fix configure for landing and on the proper approach speed power setting, and flightpath

[50] SOP Circling to Land, Revision 26, Date November 20, 2009, Chapter 6, Page 32.
[51] FAA AC 120-108 - Continuous Descent Final Approach.

before descending below the minimum stabilized approach height; e.g. 1,000 feet above the airport elevation and a rate of descent no greater than 1,000 feet per minute, unless specifically briefed."

According to the ACC FOM dated November 20, 2009, Chapter 6 page 13, ACC incorporates some language regarding stabilized approaches. It's called the stabilized approach concept and states the following;

> *"During an approach, significant speed and configuration changes can seriously complicate tasks associated with aircraft control. In addition, it can increase the difficulty of properly evaluating an approach as it progresses, and complicate the decision of the proper action to take at the decision point. The approach process is simplified by maintaining a stable speed, descent rate, vertical flight path, and configuration during the final stages of an approach. This is referred to as the stabilized approach concept.*
>
> *Detailed crew procedures are located in the Company SOP."*

FOM Chapter 5, page 13 states the following on descent and final approach in part:

1. Descent

During the descent, a constant rate of descent of about 500 ft./min. should be maintained. The top of the descent point should be calculated so that (ideally) the descent finishes at the start of the final approach. This saves fuel. The chosen descent speed will depend on local circumstances,
i.e. ATC may request a set speed. In many instances, however, the choice of speed lies with the operator. To minimize block time, maintain cruise power in the descent and allow the airspeed to increase. Reductions of airspeed may be necessary when encountering turbulent air conditions.

In the 360 if it is determined that a flaps 150 landing will be conducted, select the flap inhibit switch to "Inhibit".

2. Final Approach

Upon intercepting the final approach path power is reduced to about 1100 lbs. Tq at 1400 PRPM, 15º flaps are selected, observing the airspeed limitation, and the aircraft is trimmed into the descent at 120 kts. and the "FINAL" checks started. As the PRPM's are increased to 1675 the IAS will start to decrease without adjusting the power but should not be allowed to fall below VREF + 10 kts before landing flaps are selected, or VREF + 5 kts thereafter.

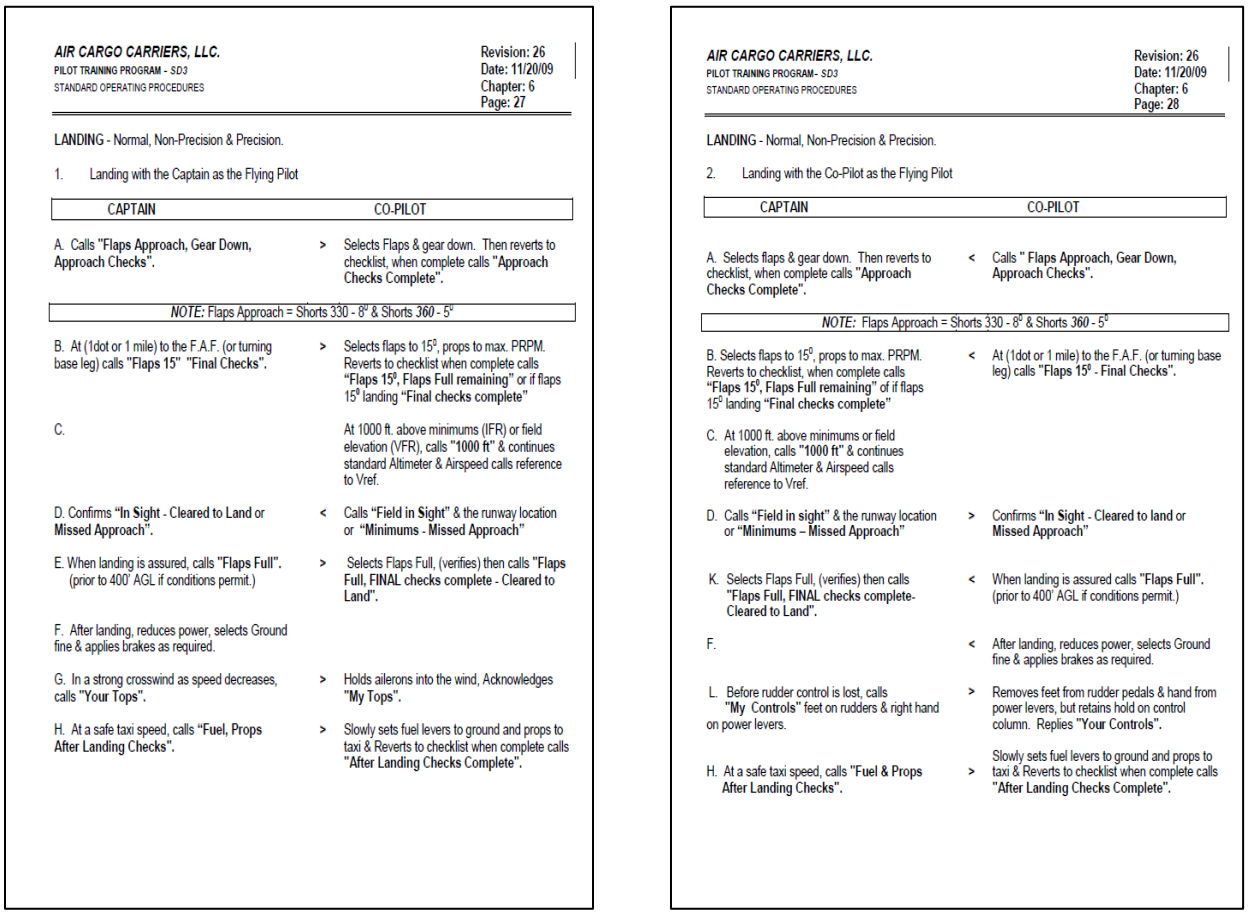
During VFR flight the location on final approach where the landing flaps selection is made varies with the conditions.

IFR approach conditions with weather "ceiling" observed 400' AGL or below a flaps 15º landing should be executed, provided runway distance is not a factor. This

will allow for a stabilized final approach. A flaps 15º landing will be determined prior to the approach and discussed during the "crew briefing" in the descent checklist. If weather conditions are observed above 400' AGL a Full Flaps landing will normally be accomplished. The selection of Full Flaps should not be made until the runway is in sight"

14.0 Normal, Non-Precision & Precision Landing "Call Outs"

ACC Standard Operating Procedures, dated November 20, 2009, Chapter 6 page 27 and 28 provided the following guidance on call outs:



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PILOT TRAINING PROGRAM - SD3
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LANDING - Normal, Non-Precision & Precision.

1. Landing with the Captain as the Flying Pilot

CAPTAIN		CO-PILOT
A. Calls **"Flaps Approach, Gear Down, Approach Checks".**	>	Selects Flaps & gear down. Then reverts to checklist, when complete calls **"Approach Checks Complete".**
NOTE: Flaps Approach = Shorts 330 - 8º & Shorts *360* - 5º		
B. At (1dot or 1 mile) to the F.A.F. (or turning base leg) calls **"Flaps 15" "Final Checks".**	>	Selects flaps to 15º, props to max. PRPM. Reverts to checklist when complete calls **"Flaps 15º, Flaps Full remaining"** or if flaps 15º landing **"Final checks complete"**
C.		At 1000 ft. above minimums (IFR) or field elevation (VFR), calls **"1000 ft"** & continues standard Altimeter & Airspeed calls reference to Vref.
D. Confirms **"In Sight - Cleared to Land or Missed Approach".**	<	Calls **"Field in Sight"** & the runway location or **"Minimums - Missed Approach"**
E. When landing is assured, calls **"Flaps Full".** (prior to 400' AGL if conditions permit.)	>	Selects Flaps Full, (verifies) then calls **"Flaps Full, FINAL checks complete - Cleared to Land".**
F. After landing, reduces power, selects Ground fine & applies brakes as required.		
G. In a strong crosswind as speed decreases, calls **"Your Tops".**	>	Holds ailerons into the wind, Acknowledges **"My Tops".**
H. At a safe taxi speed, calls **"Fuel, Props After Landing Checks".**	>	Slowly sets fuel levers to ground and props to taxi & Reverts to checklist when complete calls **"After Landing Checks Complete".**

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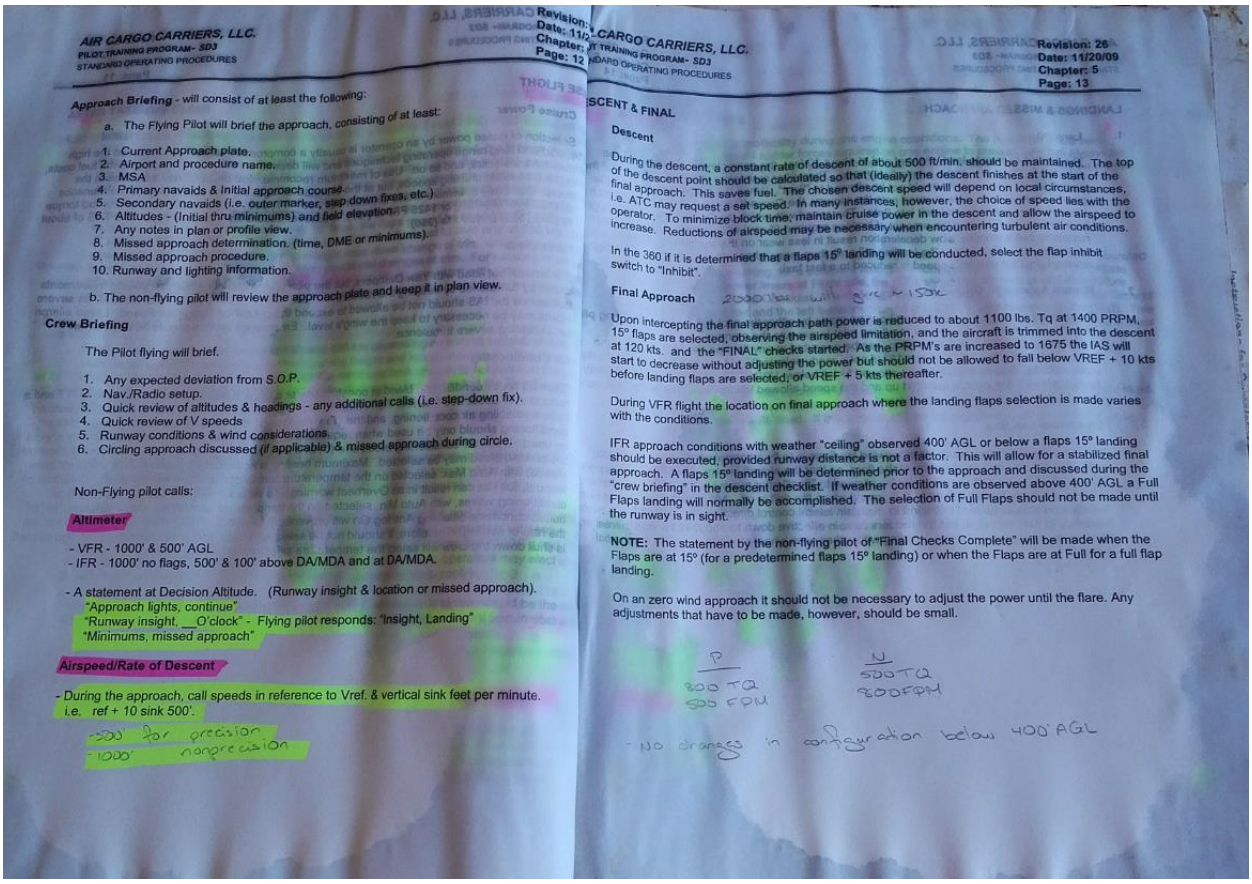
LANDING - Normal, Non-Precision & Precision.

2. Landing with the Co-Pilot as the Flying Pilot

CAPTAIN		CO-PILOT
A. Selects flaps & gear down. Then reverts to checklist, when complete calls **"Approach Checks Complete".**	<	Calls **" Flaps Approach, Gear Down, Approach Checks".**
NOTE: Flaps Approach = Shorts 330 - 8º & Shorts *360* - 5º		
B. Selects flaps to 15º, props to max. PRPM. Reverts to checklist, when complete calls **"Flaps 15º, Flaps Full remaining"** of if flaps 15º landing **"Final checks complete"**	<	At (1dot or 1 mile) to the F.A.F. (or turning base leg) calls **"Flaps 15º - Final Checks".**
C. At 1000 ft. above minimums or field elevation, calls **"1000 ft"** & continues standard Altimeter & Airspeed calls reference to Vref.		
D. Calls **"Field in sight"** & the runway location or **"Minimums – Missed Approach"**	>	Confirms **"In Sight - Cleared to land or Missed Approach"**
K. Selects Flaps Full, (verifies) then calls **"Flaps Full, FINAL checks complete- Cleared to Land".**	<	When landing is assured calls **"Flaps Full".** (prior to 400' AGL if conditions permit.)
F.	<	After landing, reduces power, selects Ground fine & applies brakes as required.
L. Before rudder control is lost, calls **"My Controls"** feet on rudders & right hand on power levers.	>	Removes feet from rudder pedals & hand from power levers, but retains hold on control column. Replies **"Your Controls".**
H. At a safe taxi speed, calls **"Fuel & Props After Landing Checks".**	>	Slowly sets fuel levers to ground and props to taxi & Reverts to checklist when complete calls **"After Landing Checks Complete".**

Figure 4. The ACC Standard Operating Procedures, [call outs] dated November 20, 2009.



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Approach Briefing - will consist of at least the following:

a. The Flying Pilot will brief the approach, consisting of at least:

1. Current Approach plate.
2. Airport and procedure name.
3. MSA
4. Primary navaids & Initial approach course.
5. Secondary navaids (i.e. outer marker, step down fixes, etc.)
6. Altitudes - (Initial thru minimums) and field elevation.
7. Any notes in plan or profile view.
8. Missed approach determination. (time, DME or minimums).
9. Missed approach procedure.
10. Runway and lighting information.

b. The non-flying pilot will review the approach plate and keep it in plan view.

Crew Briefing

The Pilot flying will brief.

1. Any expected deviation from S.O.P.
2. Nav./Radio setup.
3. Quick review of altitudes & headings - any additional calls (i.e. step-down fix).
4. Quick review of V speeds
5. Runway conditions & wind considerations.
6. Circling approach discussed (if applicable) & missed approach during circle.

Non-Flying pilot calls:

Altimeter

- VFR - 1000' & 500' AGL
- IFR - 1000' no flags, 500' & 100' above DA/MDA and at DA/MDA.

- A statement at Decision Altitude. (Runway insight & location or missed approach).
"Approach lights, continue"
"Runway insight, __O'clock" - Flying pilot responds: "insight, Landing"
"Minimums, missed approach"

Airspeed/Rate of Descent

- During the approach, call speeds in reference to Vref. & vertical sink feet per minute. i.e. ref + 10 sink 500'.

-500' for precision
-1000' nonprecision

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DESCENT & FINAL

Descent

During the descent, a constant rate of descent of about 500 ft/min. should be maintained. The top of the descent point should be calculated so that (ideally) the descent finishes at the start of the final approach. This saves fuel. The chosen descent speed will depend on local circumstances, i.e. ATC may request a set speed. In many instances, however, the choice of speed lies with the operator. To minimize block time, maintain cruise power in the descent and allow the airspeed to increase. Reductions of airspeed may be necessary when encountering turbulent air conditions.

In the 360 if it is determined that a flaps 15° landing will be conducted, select the flap inhibit switch to "Inhibit".

Final Approach

Upon intercepting the final approach path power is reduced to about 1100 lbs. Tq at 1400 PRPM, 15° flaps are selected, observing the airspeed limitation, and the aircraft is trimmed into the descent at 120 kts. and the "FINAL" checks started. As the PRPM's are increased to 1675 the IAS will start to decrease without adjusting the power but should not be allowed to fall below VREF + 10 kts before landing flaps are selected, or VREF + 5 kts thereafter.

During VFR flight the location on final approach where the landing flaps selection is made varies with the conditions.

IFR approach conditions with weather "ceiling" observed 400' AGL or below a flaps 15° landing should be executed, provided runway distance is not a factor. This will allow for a stabilized final approach. A flaps 15° landing will be determined prior to the approach and discussed during the "crew briefing" in the descent checklist. If weather conditions are observed above 400' AGL a Full Flaps landing will normally be accomplished. The selection of Full Flaps should not be made until the runway is in sight.

NOTE: The statement by the non-flying pilot of "Final Checks Complete" will be made when the Flaps are at 15° (for a predetermined flaps 15° landing) or when the Flaps are at Full for a full flap landing.

On an zero wind approach it should not be necessary to adjust the power until the flare. Any adjustments that have to be made, however, should be small.

P
800 TQ
500 FPM

N
500 TQ
800 FPM

- No changes in configuration below 400' AGL

Photo 18. The ACC Standard Operating Procedures, dated November 20, 2009 was discovered in the wreckage. Note Airspeed/Rate of Descent notation highlighted.

15.0 Descent and Approach to Runway

For descents from the MDA to landing, 14 *CFR* 91.175(c) stated in part:

> *(c) Operation below DA/ DH or MDA. Except as provided in paragraph (l) of this section, where a DA/DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, below the authorized MDA or continue an approach below the authorized DA/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.

16.0 Flight Planning

Canned flight plans exist for the flights due to the nature of the regularity and rare deviation from standard practice. Flight plans are pre-filed by Leidos (Lockheed Martin Flight Service). The flight plan for the accident is below.[52]

Aircraft Id: SNC1260
Flight Plan Id Unique High: 785977686
Flight Plan Id Unique Low: 577663
Flight Plan Id Sequence Number: 7222
Event Time: 2017 05 05 04:40:00Z
Filing Status: Primary for LMFS
Error Message Detail: N/A
Flight Leg: 1
Flight Plan Type: ICAO
Flight Rules: IFR
Flight Type: S
Number: 1
Type of Aircraft: SH33
WTC: Medium
Equipment: SDF/S
Surv: N/A
Dep Aerodrome: KSDF
Departure Time Proposed: 2017 05 05 07:40:00Z

[52] Source: ACC Dispatch

Departure Time Actual: N/A
Airspeed: 170.0 KNOTS
Altitude: A90
ETA: 2017 05 05 08:55:00Z
Route: DCT HYK V4 HVQ DCT
Dest Aerodrome: KCRW
ETE: 01:15
Arrival Time Actual: N/A
Altn Aerodrome: N/A
2nd Altn Aerodrome: N/A
Other Information: N/A
Supplemental Information: P/0
Pilot Information: N/A
Beacon Code: N/A
ADIZ Point: N/A
ADIZ Time : N/A
FS21 Notes: N/A
SE SAR Checkbox: false

F. ATTACHMENTS

Attachment 1-Operations/Human Performance Interview Summaries
Attachment 2-Original Flight Logs (6 Days)
Attachment 3-Captain New Hire Application Excerpt
Attachment 4-First Officer New Hire Application Excerpt
Attachment 5-Captain Pilot File & Training Records
Attachment 6-First Officer Pilot File & Training Records
Attachment 7-CRM PowerPoint
Attachment 8-CRW Airport Charts