Crash Following In-Flight Fire
Fresh Air, Inc.
Convair CV-440-38, N153JR
San Juan, Puerto Rico
March 15, 2012

Accident Report

NTSB/AAR-14/04
PB2015-101257

National Transportation Safety Board

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National
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Safety Board

490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

National Transportation Safety Board. 2014. ***Crash Following In-Flight Fire, Fresh Air, Inc., Convair CV-440-38, N153JR, San Juan, Puerto Rico, March 15, 2012*****. Aircraft Accident Report NTSB/AAR-14/04. Washington, DC.**

Abstract: This report discusses the March 15, 2012, accident involving a Convair CV-440-38, N153JR, operated by Fresh Air, Inc., which crashed into a lagoon about 1 mile east of the departure end of runway 10 at Luis Muñoz Marín International Airport, San Juan, Puerto Rico. The two pilots died, and the airplane was destroyed by impact forces. Safety issues include inadequate Federal Aviation Administration (FAA) oversight of 14 *Code of Federal Regulations* (CFR) Part 125 operations, inadequate evaluation of Fresh Air's compliance with FAA-approved procedures, and evaluation of 14 CFR Part 125 pilots using another operator's operations specifications. Safety recommendations are addressed to the FAA.

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Contents

Figures

Abbreviations

AD	airworthiness directive
ADI	antidetonation injection
AFM	airplane flight manual
ASI	air safety inspector
ATC	air traffic control
CG	center of gravity
CFR	*Code of Federal Regulations*
CMO	certificate management office
FAA	Federal Aviation Administration
FSDO	flight standards district office
GA	general aviation
GM	general manager
GOM	general operations manual
mi	mile
min	minute
msl	mean sea level
NTSB	National Transportation Safety Board
OpsSpecs	operations specifications
PAI	principal avionics inspector
PF	pilot flying
PIC	pilot-in-command
PM	pilot monitoring
PMI	principal maintenance inspector
POI	principal operations inspector
PRPA	Puerto Rico Port Authority
SB	service bulletin
SIC	second-in-command
SJU	Luis Muñoz Marín International Airport
$\mathbf{V_{mc}}$	minimum controllable airspeed with one engine inoperative

Executive Summary

On March 15, 2012, about 0740 Atlantic standard time, a Convair CV-440-38, N153JR, operated by Fresh Air, Inc., crashed into a lagoon about 1 mile east of the departure end of runway 10 at Luis Muñoz Marín International Airport (SJU), San Juan, Puerto Rico. The two pilots died, and the airplane was destroyed by impact forces. The airplane was operated under the provisions of 14 *Code of Federal Regulations* (CFR) Part 125[1] as a cargo flight. Visual meteorological conditions prevailed at the time of the accident, and a visual flight rules flight plan was filed. The flight had departed from runway 10 at SJU destined for Princess Juliana International Airport, St. Maarten. Shortly after takeoff, the first officer declared an emergency, and then the captain requested a left turn back to SJU and asked the local air traffic controllers if they could see smoke coming from the airplane (the two tower controllers noted in postaccident interviews that they did not see more smoke than usual coming from the airplane). The controllers cleared the flight to land on runway 28, but as the airplane began to align with the runway, it crashed into a nearby lagoon (Laguna La Torrecilla).

Radar data shows that the airplane was heading south at an altitude of about 520 ft when it began a descending turn to the right to line up with runway 28. The airplane continued to bank to the right until radar contact was lost. The estimated airspeed at this point was only 88 knots, 9 knots below the published stall speed for level flight and close to the 87-knot air minimum control speed. However, minimum control speeds increase substantially for a turn into the inoperative engine as the accident crew did in the final seconds of the flight. As a result, the airplane was operating close to both stall and controllability limits when radar contact was lost.

Pilots flying multiengine aircraft are generally trained to shut down the engine experiencing a problem and feather that propeller; thus, the flight crew likely intended to shut down the right engine[2] by bringing the mixture control lever to the IDLE CUTOFF position and feathering the right propeller, as called out in the Engine Fire In Flight Checklist. This would have left the flight crew with the left engine operative to return to the airport. However, postaccident examinations revealed that the left propeller was found feathered at impact, with the left engine settings consistent with the engine at takeoff or climb setting. The right engine settings were generally consistent with the engine being shut down; however, the right propeller's pitch was consistent with a high rotation/takeoff power setting. The accident airplane was not equipped with a flight data recorder or a cockpit voice recorder (nor was it required to be so equipped); hence, the investigation was unable to determine at what point in the accident sequence the flight crew shut down the right engine and at what point they feathered the left propeller, or why they would have done so.

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[1] Title 14 CFR Part 125 applies to large airplanes that are configured for 6,000 lbs or more of payload capacity or 20 or more passengers when these airplanes are being used for any purpose other than common carriage. A carrier becomes a common carrier when it holds itself out to the public, or to a segment of the public, as willing to furnish transportation within the limits of its facilities to any person who wants it.

[2] Although the investigation was not able to determine why the crew chose to shut down the engine, they likely suspected an engine fire due to the smoke.

Postaccident examination of the airplane revealed fire and thermal damage to the airframe on the airplane's right wing rear spar, nacelle aft of the power section, and in the vicinity of the junction between the augmentor assemblies and the exhaust muffler assembly. While the investigation was unable to determine the exact location of the ignition source, it appears to have been aft of the engine in the vicinity of the junction between the augmentor assemblies and exhaust muffler assembly. The investigation identified no indication of a fire in the engine proper and no mechanical failures that would have prevented the normal operation of either engine.

The safety issues identified in this accident include the following:

- **Inadequate Federal Aviation Administration (FAA) oversight of Part 125 operations.** The investigation found that many of the operator's operation and maintenance records were incomplete or nonexistent. The FAA requires annual inspections of each certificated operator, including a review of pilot records, pilot currency, and aircraft maintenance. During the last documented main base inspection, which occurred just over 2 months before the accident, the principal operations inspector (POI) should have discovered the recordkeeping discrepancies and instructed the operator to verify the captain's currency; however, he did not. Likewise, the principal maintenance inspector and the principal avionics inspector should have discovered Fresh Air's deficient aircraft maintenance recordkeeping during the last documented aircraft records inspection, which was conducted 7 days before the accident, or during any of the six inspections conducted in the year before the accident; however, they did not. Further, the National Transportation Safety Board (NTSB) found evidence suggesting that FAA oversight of Part 125 operations was not seen as a priority. Fresh Air's POI told investigators that Part 125 was generally "a GA [general aviation] operation," not an air carrier operation. While most of its flights were relatively close to San Juan, Fresh Air's FAA-approved operations specifications (OpsSpecs) authorized it to operate commercially over the 48 contiguous states, meriting far more scrutiny than "a GA operation." Multiple FAA inspectors failed to perform effective, basic oversight of Fresh Air, possibly due to a belief that Part 125 operations merit less scrutiny than Part 121 and Part 135 operations, and despite the fact that Fresh Air's airplanes fly over populated areas within the national airspace system.
- **Inadequate evaluation of Fresh Air's compliance with FAA-approved procedures.** The investigation revealed the FAA's failure to detect and address discrepancies between Fresh Air's approved procedures and its operations, including cargo loading, pilot currency, company recordkeeping, and pilot evaluation. For example, Fresh Air pilots were operating the airplane with the autofeather and antidetonation injection systems off, yet using a higher gross takeoff weight than permitted with these systems off, contrary to the FAA-approved airplane flight manual. Because the POI had never directly observed Fresh Air's operation, he was unaware that the airplanes were being operated contrary to the limitations outlined in the airplane flight manual.
- **Evaluation of Part 125 pilots using another operator's OpsSpecs.** The investigation revealed confusion among operators and FAA personnel regarding the applicable OpsSpecs that check airmen must use during certain checkrides. While it

unlikely affected the captain's capability to handle the accident, his competency check was not necessarily conducted using Fresh Air's OpsSpecs or operations manual. While the investigation could not determine under which company's OpsSpecs and operations manual the captain was evaluated for the Convair, the captain's DC-4 evaluation was conducted using another company's OpsSpecs and operations manual.

The NTSB determines that the probable cause of this accident was the flight crew's failure to maintain adequate airspeed after shutting down the right engine due to an in-flight fire in one of the right augmentors. The failure to maintain airspeed resulted in either an aerodynamic stall or a loss of directional control.

As a result of this investigation, the NTSB makes three recommendations to the FAA.

1. The Accident

1.1 History of Flight

On March 15, 2012, about 0740 Atlantic standard time,[3] a Convair CV-440-38, N153JR, operated by Fresh Air, Inc., crashed into a lagoon about 1 mile (mi) east of the departure end of runway 10 at Luis Muñoz Marín International Airport (SJU), San Juan, Puerto Rico. The two pilots died, and the airplane was destroyed by impact forces. The airplane was operated under the provisions of 14 *Code of Federal Regulations* (CFR) Part 125[4] as a cargo flight. Visual meteorological conditions prevailed at the time of the accident, and a visual flight rules flight plan was filed. The flight had departed from runway 10 at SJU destined for Princess Juliana International Airport, St. Maarten. Shortly after takeoff, the first officer declared an emergency, and then the captain requested a left turn back to SJU and asked the local air traffic controllers if they could see smoke coming from the airplane (the two tower controllers noted in postaccident interviews that they did not see more smoke than usual coming from the airplane). The controllers cleared the flight to land on runway 28, but as the airplane began to align with the runway, it crashed into a nearby lagoon (Laguna La Torrecilla).

Flight logs indicated that early on the morning of the accident, the captain repositioned another airplane from Henry E. Rohlsen Airport, St. Croix, US Virgin Islands, to SJU. The captain then met the first officer at the accident airplane at SJU. According to the Holsum de Puerto Rico invoice for bread products, the accident airplane's total cargo load was 12,100 lbs. The estimated ramp weight of the airplane was 47,710 lbs, but the maximum allowable takeoff weight of the airplane was 40,900 lbs.[5]

Before the flight, the captain started both engines and conducted a 15- to 20-minute (min) run-up; ground personnel did not report hearing or seeing anything unusual. The flight crew was issued departure instructions to fly the standard eastern departure for visual flight rules flight following to St. Maarten. The flight crew then requested a second engine run-up, which was typical according to an air traffic tower controller; the controller instructed the flight crew to conduct the run-up on taxiway Charlie while holding short of taxiway Bravo. After completing the second engine run-up, the flight crew requested clearance to taxi to runway 10, where the flight was cleared for takeoff at 0734:48. Visibility was 10 mi with a 5-knot wind from 120˚.

The airplane lifted off at 0735:45; at 0737:27, the first officer contacted the SJU departure controller to declare an emergency and the captain then requested a left turn back to

[3] The times in this report are Atlantic standard time, unless otherwise noted.

[4] Title 14 CFR Part 125 applies to large airplanes that are configured for 6,000 lbs or more of payload capacity or 20 or more passengers when these airplanes are being used for any purpose other than common carriage. A carrier becomes a common carrier when it holds itself out to the public, or to a segment of the public, as willing to furnish transportation within the limits of its facilities to any person who wants it.

[5] The Convair CV-440's maximum allowable takeoff weight of 48,000 lbs requires use of both the antidetonation injection and autofeather systems; however, because neither system was used on the accident flight, the maximum allowable takeoff weight was 40,900 lbs. See section 1.3.2.

the airport. He then asked if tower control personnel could see smoke coming from one of the airplane's engines; the controller acknowledged the transmission but did not verify the smoke[6] and, at 0738:05, cleared the flight to land on runway 10.

Radar data indicate that as the airplane continued to climb, the airspeed varied between 140 and 160 knots. The captain then asked again if tower personnel could see any smoke coming from one of the airplane's engines before stating, "…we're gonna need to land on runway, ah, two eight (unintelligible)." The airplane reached a maximum altitude of about 935 ft mean sea level (msl) at 0738:14 during an approximate 30˚ left-banked turn back to the airport. The tower controller cleared the airplane to land on runway 28. At 0738:32, the captain replied, "…affirmative, uh, is runway eight available, to[o] high…," which was the last transmission from the accident airplane; the airplane then descended to 500 ft msl. The airplane banked to the right starting at 0739:10; the airspeed was about 140 knots. The airplane continued to bank to the right. Before radar contact was lost at 0739:53, the last estimated airspeed was 88 knots, and the altitude was 110 ft msl. The controller reported that the airplane crashed at 0740:23. Figure 1 shows the radar ground track and air traffic control (ATC) communications during the accident airplane's takeoff and attempted return to SJU.

[6] Although the air traffic control transcript indicates that the controller stated, "uh the engine is smoking" after the flight crew asked "you see the smoke off of three juliett romeo," the two tower controllers noted in postaccident interviews that they did not see more smoke than usual coming from the airplane. Thus, his statement was simply an acknowledgement of the pilot's transmission.

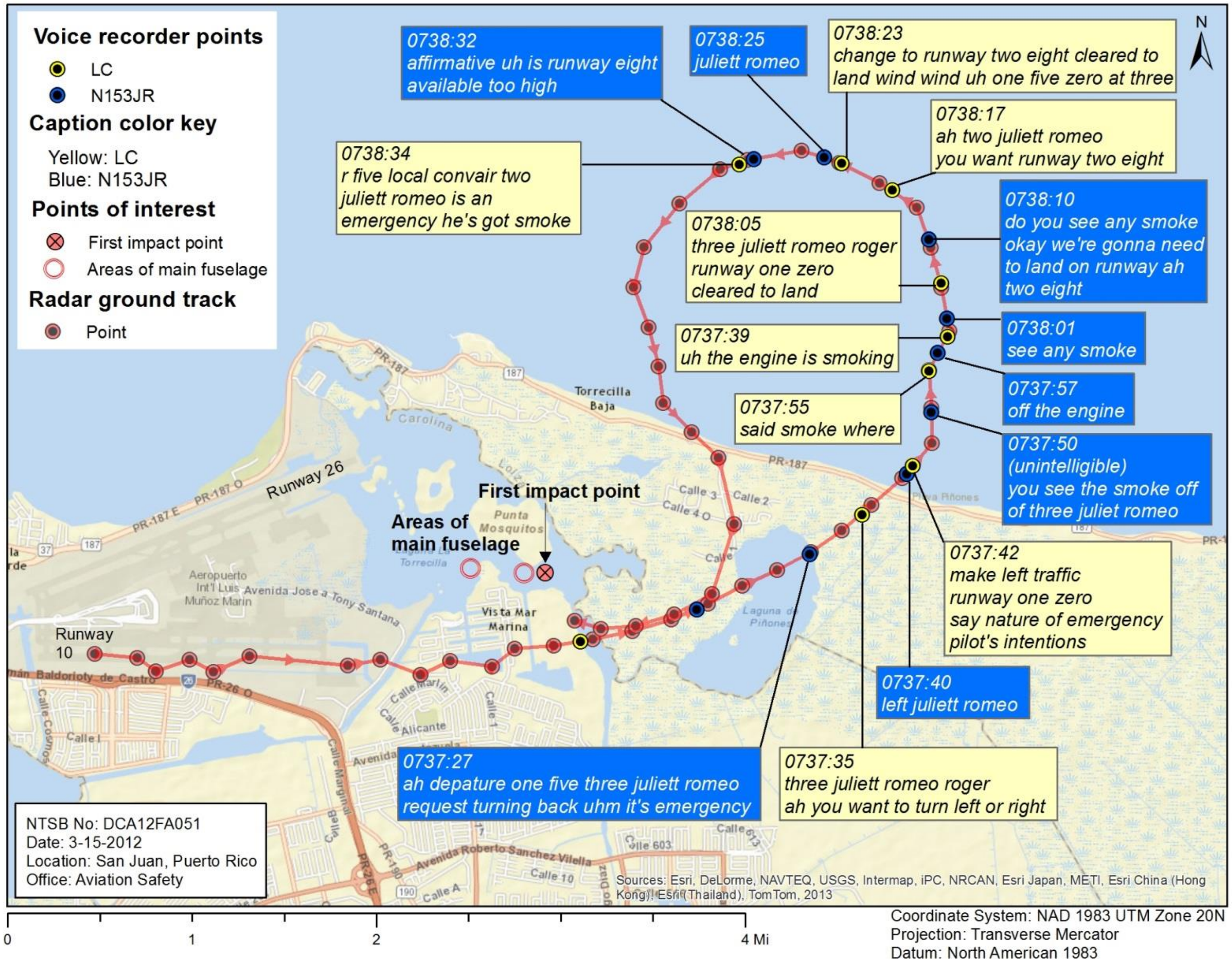

Figure 1. Radar ground track and ATC communications during N153JR's takeoff and attempted return to SJU.

A Puerto Rico Port Authority (PRPA) official familiar with the accident airplane was in a truck near the south side of the airport terminal and observed the takeoff; he saw nothing unusual with the airplane's departure. A security video briefly captured the accident airplane's initial climb over the departure end of runway 10, and no smoke or fire was visible. A witness on the second floor of an apartment complex about 1 mi east of the airport and just south of the extended centerline of runway 10 observed the accident airplane's departure and heard "a strange noise" in one of the engines that he described as an "intermittent surge." He saw the airplane losing altitude and then begin a turn to the north. The PRPA official observed the flight returning to the airport before entering a sharp right-descending turn toward Laguna La Torrecilla, about 1 mi east of SJU. The PRPA video camera captured images of the airplane impacting the lagoon. Witnesses then observed, and the video showed, a large black plume of smoke rising from the lagoon. Rescue vehicles and PRPA officials arrived on scene about 0804, setting up a perimeter around the wreckage and beginning rescue operations.

1.2 Crew Information

Pilots operating under Part 125 are not required to receive any specific training as defined by the Federal Aviation Regulations. However, per 14 CFR 125.287(b), captains are required to meet certain experience requirements, and both pilots are required to receive an annual competency check. In addition, per 14 CFR 125.291(a), each pilot-in-command (PIC) must receive an instrument proficiency check every 6 months. The instrument proficiency check is generally a more comprehensive check, so Part 125 allows the pilot to substitute an instrument proficiency check for the competency check. A competency or instrument flight rules proficiency check requires the pilot to physically manipulate the controls of the airplane and may include any of the maneuvers and procedures currently required for the original issuance of the particular pilot certificate or rating required for the operations authorized and appropriate to the category, class, and type of airplane involved.

A check airman evaluation flight is also required for check airmen every 2 years in the specific type of airplane he or she plans to conduct evaluations in. Check airman evaluation flights are a practical test of the check airman's ability to test other airmen, not of his or her flying ability. A proficiency check or Part 125 competency check, and a check airman observation, are separate evaluations and are not combinable on a single evaluation.

1.2.1 The Captain

1.2.1.1 Certification and Experience

The captain, age 65, held an airline transport pilot certificate with airplane multiengine land instrument, commercial pilot, and airplane single-engine land ratings, issued on January 12, 2010. His Federal Aviation Administration (FAA) second-class medical certificate was issued on May 26, 2011 (valid for 2 years), with the limitation that he must wear corrective lenses. The captain was the co-owner of Fresh Air and the PIC for the accident flight. According to Fresh Air's pilot records, the captain flew the Convair CV-440 for Miami Air Lease in 2005 and then received basic indoctrination training at Fresh Air on August 29, 2005, after purchasing Fresh Air. He was one of two full-time captains for the company, served as the Fresh Air director of operations, and was Fresh Air's only check airman. Fresh Air's employment records indicated that he had 22,586 hours of total pilot flying time, 21,925 hours of which were as PIC. The records indicated that he had flown about 9,000 hours in the Convair CV-340/440 and that he had 34 and 104 hours of total flying time in the 30 and 90 days before the accident, respectively.

A former Fresh Air captain and a former Fresh Air first officer both stated that the accident captain typically flew the heavy loaded legs out of SJU and that the first officer would fly the empty return legs. Another captain also stated that while he was a first officer, the accident captain would usually fly the cargo, or heavy, legs, while he flew the lighter, empty legs, and that as he was getting close to becoming a Convair captain, the accident captain would let him fly the heavy legs to get a feel for the airplane.

1.2.1.2 Currency of Captain's Competency Check

The captain's initial type rating in the Convair CV-340 was on September 19, 1977. On June 24, 2010, the captain received a Part 125 competency check (valid until June 30, 2011) in the Convair CV-440 from a Tiger Contract Cargo, Inc., check airman. The Fresh Air general manager (GM), who was also the captain's son and whose duties included maintenance of pilot records, was unable to verify that the captain had received a competency check or instrument proficiency check in the 12 months before the accident. He said that the captain received his check airman observation in "September or October" of the previous year and that the GM understood that it was both a proficiency check and a check airman observation with the FAA. According to the FAA air safety inspector (ASI) at SJU who conducted the observation, the captain had a check airman observation on September 23, 2010, but this was not a competency check. Other Part 125 operators of the Convair indicated that none had provided a competency check on the accident captain in the 12 months before the accident.

1.2.1.3 Preaccident Activities

Limited information was available regarding the captain's activities in the 72 hours before the accident. The captain sent and received multiple phone calls and text messages on March 12, with several extended breaks[7] in phone activity. Airport records from the airport indicated that the captain was processed through customs in St. Croix about 1238 after arriving on a Fresh Air flight. His other activities on March 12 were unknown, and the captain remained in St. Croix overnight.

On March 13, 2012, the captain was precleared through customs in St. Croix about 1403. A flight itinerary for the captain indicated that he was scheduled to depart St. Croix on a commercial flight about 1500 and arrive in Santo Domingo, Dominican Republic, about 1744 after changing planes in San Juan. He remained in Santo Domingo overnight.

On March 14, 2012, the captain was scheduled to depart Santo Domingo on a commercial flight about 1029 and arrive in St. Croix about 1404 after changing planes in San Juan. He

[7] An extended break in phone activity consisted of no phone activity logged, incoming text messages logged without an outgoing text message in response, or incoming calls logged that were routed to voicemail.

remained in St. Croix overnight. The captain made and received multiple phone calls and text messages from about 1147 until about 2343, at which time he checked his voicemail.

On the day of the accident, the captain received a phone call about 0343. Cell phone activity consisted of multiple calls and text messages until about 0657 with an extended break in cell phone activity from about 0427 to about 0546. The captain then repositioned a DC-4 from St. Croix to San Juan. According to the Fresh Air DC-4 flight log, the captain departed St. Croix about 0510 and arrived in San Juan about 0540. Fresh Air's general operations manual (GOM) stated that "As a general rule one hour prior to proposed or scheduled departure will be considered adequate for crew reporting to the operations base or departure airport."

1.2.1.4 Recent Event with Fresh Air

On January 17, 2011, the captain witnessed an in-flight fire aft of the left engine on a Tiger Contract Cargo Convair CV-440 shortly after takeoff from St. Thomas, US Virgin Islands.[8] Fresh Air's GM said that the captain was overflying that flight in another airplane, saw the fire, and radioed the pilots to tell them that they had a fire and needed to turn around; they made it back, according to the GM, "by the skin of their teeth." Postaccident examination of the airplane's left engine revealed a discrepancy in two cylinders in which the pistons did not move during rotation of the engine. This discrepancy may have resulted in unburned fuel or oil entering the exhaust system and igniting in the exhaust or augmentor assemblies. Although the augmentor assemblies were not available for examination, the location of the fire suggests that there was a leak in the vicinity of the augmentor assemblies and muffler junction, causing the fire to burn inside the nacelle rather than exit out the aft end of the muffler.

1.2.2 The First Officer

1.2.2.1 Certification and Experience

The first officer, age 44, held a second-in-command (SIC) rating on the Convair CV-440. According to the FAA, the first officer's commercial pilot certification was issued on September 3, 2008, and his FAA second-class medical certificate was issued on January 20, 2012. The first officer was originally hired by Fresh Air as a Convair first officer in 2007 before leaving on February 18, 2008, to work as a mechanic for Seaborne Airlines. He was rehired by Fresh Air and received basic indoctrination training on February 24, 2012. He also received an SIC proficiency check on the Convair CV-440 from the accident captain on February 24, 2012. Fresh Air's employment records indicated that he had 2,716 hours of total pilot flying time, 200 hours of which were as PIC (none in the Convair CV-440) and 700 hours of which were as SIC of the Convair CV-340/440. He had 16 hours of total flying time in the last year, all within the 30 days before the accident.

According to the FAA, the first officer received both his private and commercial airplane single-engine land and instrument airplane certificates in 1996 and his commercial airplane

[8] More information about this event, NTSB case number ERA11LA117, is available online at www.ntsb.gov/aviationquery/index.aspx.

single-engine and multiengine land and instrument airplane certificate in 2001. However, between 1996 and 2008, he received five notices of disapproval in the following areas: performing chandelles and lazy 8s, proper holding pattern entry and basic very high frequency omnidirectional radio range interception (twice) and tracking, very high frequency omnidirectional radio intercepts (again), preflight preparation and cross-country flight planning, and performance maneuvers.

While at Seaborne Airlines, the first officer expressed interest in joining the flight operations department as a pilot, and in early 2009, he started ground school. After completing ground school, he began a 5-day simulator training course. Seaborne Airline's director of operations indicated that he determined that the first officer was not "up to par" during simulator training. He stated that while the first officer did fine in ground school and passed the written tests, his piloting skills were below average and that he had trouble keeping up with the pace required to get through simulator training. Specifically, he recalled that the first officer struggled trying to "manage the platform while flying." He added that the first officer was not a good pilot in general, rather than having specific areas of trouble in training.

1.2.2.2 Preaccident Activities

Limited information was available regarding the first officer's activities in the 72 hours before the accident. Cell phone records were obtained for the cell phone number registered to the first officer; however, no other information was available to determine his activities. The day before the accident, the first officer sent and received multiple calls and text messages, with several extended breaks in phone activity. The calls and text messages occurred between about 1030 and about 2255.

On the day of the accident, the first officer received an incoming call about 0505. Cell phone activity consisted of multiple calls and text messages until about 0719. There was an extended break in phone activity of at least 1 hour from about 0556 until about 0659.

1.3 Airplane Information

The accident airplane, a Convair CV-440-38, serial number 117, N153JR, was a two-pilot, all-metal, low-wing, pressurized airplane originally designed and built as a passenger airplane. (See section 1.3.1 for information on the airplane's conversion.) Figure 2 shows a photograph of the accident airplane. The accident airplane was powered by two Pratt & Whitney R-2800-52W and -103W supercharged 18-cylinder radial engines[9] with full feathering hydromatic propellers and was equipped with a fire detection and warning system, as well as an extinguishing system for the engines and nacelles. The detection system relied on a series of thermocouple sensors on two loops located in the power section and body section of each nacelle that would detect fires around the engine area, the engine accessory area, and the main landing gear wheel well area.

[9] According to the type certificate data sheets for the engines, the Pratt & Whitney R-2800-52W and -103W are essentially the same except for a difference in carburetor settings and are equivalent to the civil dual-wasp model CB17.

Figure 2. Preaccident photograph of N153JR.

The CV-440 exhaust system includes two manifold assemblies, two tubular thrust augmentor assemblies, a transition assembly, and a muffler for each engine, as illustrated in figure 3. The augmentor tubes are located in the upper body section of the engine nacelle; their purpose is to channel engine exhaust gases and cylinder cooling air from the power section and exhaust them through a muffler. The augmentor tubes also serve as heat exchangers by circulating air through the spaces between the airplane's inner and outer skin. This heated air is used directly for thermal anti-icing and as the source of heat for the cabin heat exchanger. A mechanic familiar with the Convair CV-440 noted that exhaust fires can occur in the augmentors on this type of airplane. Under normal conditions, the fire is exhausted out the muffler assembly and into the air, resulting in little or no damage to the airplane. However, the mechanic noted that oil and fuel leaks at the augmentor/muffler junction do occur.

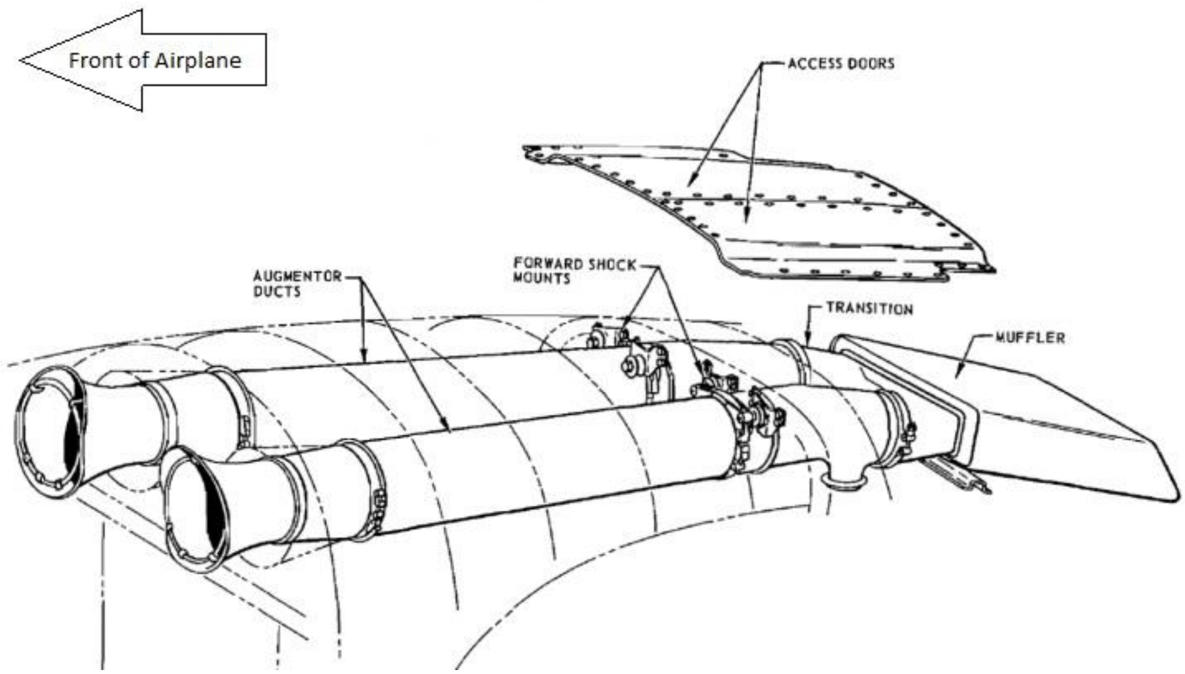

Figure 3. View of the Convair CV-440's augmentor and exhaust muffler assemblies.

Fresh Air's GOM included an Engine Fire In Flight checklist for the CV-440. The checklist denoted calls for the nonflying pilot (N), flying pilot (P), and first officer (F). The checklist, shown below, was not a memory item.

<u>Engine Fire In Flight</u>
(N) Engine Failure Checks…………….……..Complete (P)
(N)(No.1 or 2) T-Handle………………………Pulled (P)
(N)(No.1 or 2) Mixture Idle-Cutoff……..…....Set (P)
(N)(No.1 or 2) Boost Pump Off………………Off (P)
(N)(No.1 or 2) Cowl Doors Closed……………Set (P)
(N)(No.1 or 2) Emer. Heat Srce Valves………Closed (F)
(N)Select Main Bottle…………………………Selected (P)
(N)Discharge Main……………………………Discharged (P)
<u>If Required</u>

1.3.1 Accident Airplane's Conversion

The accident airplane was originally manufactured in 1953 by Convair, a division of General Dynamics Corporation, as a CV-340 with twin circular exhaust muffler assemblies, one installed at the aft end of each augmentor and readily visible at the aft end of the wing. Convair developed and received approval for modifications to the CV-340[10] that would allow an operator to modify it to the CV-440. The CV-440 has an improved exhaust muffler assembly that contained one rectangular exit duct at the aft edge of the wing. The exhaust transition assembly was attached to the aft end of each augmentor and routed the exhaust together into a common duct that was then fastened to the rectangular exhaust exit duct. The CV-440 also has modified engine cowlings, engines, flap seals, and certain engine instruments.

The accident airplane's external data plate designated the airplane model as a Convair CV-340/440-38, serial number 117. Two data plates were installed on the main entry door jamb: one designated the model as a 340 with serial number 117 and a manufacture date of September 21, 1953; the other stated, "THIS ACFT SN# 117 MODIFIED TO INCLUDE S/B 340-144B MEETS PERFORMANCE LIMITATIONS OF 440 CAA APPROVED FLIGHT MANUAL RHOADES AVIATION INC. CRS# JRAR338F." The investigative team found no record of Convair Service Bulletin (SB) 340-144B being performed on the accident airplane. However, physical evidence from the wreckage was consistent with some, if not all, of the modifications associated with the SB having been incorporated on the accident airplane. Fresh Air's GM said that the airplane had been converted from a Convair CV-340 to a CV-440 "years ago" and that they kept CV-440 manuals on board, including at the time of the accident. Fresh Air's GOM required that the CV-440 airplane flight manual (AFM) be on board at all times, and the operations specifications (OpsSpecs) listed the airplane as a CV-440.

1.3.2 Antidetonation Injection and Autofeather Systems

The accident airplane was equipped with a water injection system that served both engines to allow for operations at increased maximum power and for reserve power in the event of a go-around, obstacle clearance, or similar emergency. The water injection system generates additional power by leaning out the fuel-air mixture to best maximize mixture strength and by operating at a higher manifold pressure to permit the engine to operate safely at a higher power setting. To prevent detonation, water is injected to cool the intake charge from the engine supercharger and to retard the speed of the flame travel in the combustion chamber. The water injection fluid, commonly referred to as antidetonation injection (ADI) fluid, is a mixture of distilled water and methyl alcohol.[11] A tank with a capacity of 22.5 US gallons (22 gallons usable), located in the right wing fillet, contained the water supply and water pump. The Convair CV-440 AFM required that the ADI system be operative for all takeoffs at the maximum allowable takeoff weight. The maximum allowable operating weight for a takeoff with the ADI system inoperative, according to the Convair CV-340 AFM (performance section C) and the CV-440 AFM (performance information part K), was 40,900 lbs. With the ADI system operative, the maximum allowable takeoff weight is 48,000 lbs.[12] No actual weight and balance

[10] Service Bulletin (SB) 340-144B, "Performance Improvement Program," was issued in February 1958 and specified the incorporation of eight additional SBs that would modify the CV-340 to a CV-440.

[11] The Fresh Air GM told investigators that the ADI system was a 50/50 water/alcohol mix and that they also added fish oil "to keep the lines clear." For the most part, they used only water because there was little chance that the lines would freeze up during island operations. They typically loaded at least 11 gallons of water in the 22.5-gallon tank (that was a minimum to ensure that it was available for takeoff).

[12] The AFM notes that a maximum takeoff weight of 49,100 lbs may be attained using 108/135 octane AvGas; however, the accident airplane was fueled with standard 100/130 octane AvGas.

information or flight manifest was available, but investigators estimated the weight of the airplane at takeoff to be 47,510 lbs, which included 12,054 lbs of cargo.

Takeoffs using the ADI system were referred to as “wet” takeoffs for performance calculations, and takeoffs not using the ADI system were referred to as “dry” takeoffs. A former Fresh Air captain stated that most pilots would use dry power settings, especially on long runways, rather than use the wet ADI system because it meant injecting a methanol/water mixture into the engine, which was corrosive. He did not think that there was a weight penalty for dry takeoffs. Another former Fresh Air Convair pilot noted that he rarely saw the ADI system used for a takeoff. He said that it was helpful when taking off at maximum gross weight but did not know if not using the ADI system would change the maximum gross takeoff weight. He recalled using the ADI system once when fully loaded and remembered that they got some backfire on takeoff, so they turned the ADI system off. Another former Fresh Air Convair pilot stated that they never used the ADI system for takeoff. When asked what the dry maximum takeoff weight was for the Convair CV-440, he said “48,000 [lbs] for all takeoffs.” A former Fresh Air first officer did not remember ever using the ADI system.

The accident airplane’s propellers could be automatically feathered in the event of an engine failure if the autofeather system is activated before takeoff. If the autofeather system is not activated, the propellers could be manually feathered via two red push-pull buttons on the cockpit overhead switch panel. With the autofeather system activated, as one propeller was being feathered, a blocking relay would simultaneously be energized, which would prevent the opposite propeller from feathering. The maximum allowable operating weight for a takeoff with the autofeather system inoperative was 43,500 lbs.

A former Fresh Air pilot said that he had been verbally briefed on the autofeather system but that it was not demonstrated. He also said that he was told that the autofeather system would activate with a backfire in the engine and that you would not necessarily want to feather the propeller in that case. Another former Fresh Air pilot said that the autofeather system was installed on the accident airplane but was not operative because its circuit breaker was pulled.[13] Fresh Air’s GM said that the accident captain would use his discretion in using the autofeather system but that the captain did not like to use it because of his concern that it would feather an engine with a momentary power loss or backfire during a critical phase of flight. The GM added that he knew of no performance or weight penalty for not using the autofeather system.

1.3.3 Flight Characteristics

Several Convair CV-340/440-rated pilots indicated that the airplane’s single-engine climb performance was limited when fully loaded. One stated that when the airplane was not fully loaded, it would climb about 500 ft per minute with a single engine. However, he and several other Convair pilots believed that the Convair CV-340/440 would only hold altitude, at best, on a single engine when heavily loaded. A former Fresh Air Convair first officer stated that the airplane would not maintain altitude in a turn while heavily loaded and operating with a single engine, adding that “Convair 340s and 440s were under powered.”

[13] The automatic feather switch was found in the DOWN/UNARMED position after the accident; however, the state of the autofeather system’s circuit breaker could not be established due to impact damage.

Fresh Air's co-owner, president, and former director of maintenance was also a Convair captain. He stated that the Convair would maintain altitude with one operative engine during a bank if you "treated her like a baby" and added less than about 5 to 10° of bank angle. He further described the typical stall characteristic of the airplane as being "like a butterfly" because "she had so much wing, but a full stall was a different story. You'd be looking at the ground."

1.3.4 Airplane Performance Study

The National Transportation Safety Board (NTSB) conducted an airplane performance study to estimate the airplane's position, airspeed, altitude, and other parameters throughout the accident flight. The study primarily relied on radar data because the airplane was not equipped with a flight data recorder or a cockpit voice recorder, nor was it required to be so equipped. The study established the accident flight's radar-derived ground track, altitude, and airspeed during takeoff and the attempted return to SJU, using the wind and atmospheric conditions that were reported around the time of the accident. In addition, the study estimated the airplane's attitude and heading for the 4-min flight.

According to ATC communications, the flight crew declared an emergency about 2 1/2 min after being cleared for takeoff on runway 10. The airplane reached a maximum altitude of about 935 ft msl during an approximate 30° left-banked turn back to the airport. The airplane continued to climb throughout the flight until it was cleared to land. As seen in figure 4, the flight's airspeed was nominally between 140 knots and 160 knots for most of the flight, except for a brief moment when the airplane descended to 500 ft msl and again in the final 15 seconds before radar contact was lost. The last estimated airspeed was 88 knots at an approximate altitude of 110 ft msl.

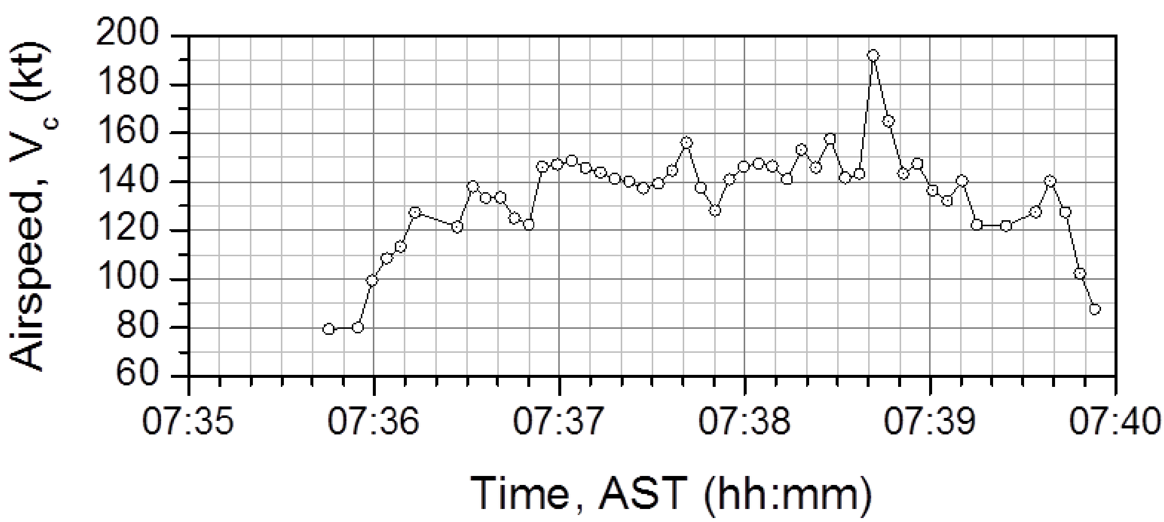

Figure 4. N153JR's airspeed.

According to the Convair CV-440 AFM, at an altitude just above sea level, the minimum control speed is 87 knots indicated for the Convair CV-440 and the stall speed for level flight[14] is 97 knots. The estimated airspeed at the final radar point, 88 knots, was 9 knots below the published stall speed and close to the minimum control speed. However, minimum control speeds increase substantially for a turn into the operative engine, as the accident crew did in the final seconds of flight. As a result, the airplane was operating close to both stall and controllability limits when radar contact was lost.

1.4 Wreckage and Impact Information

The right wingtip of the airplane initially struck trees on the southern shore of the lagoon, and a 5-ft-long section of the right wingtip and aileron were recovered near the struck trees. The remainder of the airplane was recovered from the lagoon. The right engine and propeller were found closer to the southern shore, and the left engine, propeller, cockpit, and fuselage aft of the wing section were found closer to the north shore. The fuselage and wing sections were fragmented from impact with the water. Measurements of the initial tree impact indicated that the airplane struck the trees at a bank angle of about 39˚ right-wing-down.

1.4.1 Postaccident Examination

Postaccident examination of both engines revealed no mechanical failures that would have prevented their normal operation. No thermal distress or fire damage was observed on either the left or right engine or exhaust manifolds. The left engine's throttle control lever and throttle valve were found in the fully OPEN position, and the engine mixture control was found almost against the FULL RICH stop, all consistent with the engine at takeoff or climb setting. The right engine's throttle control lever was found in the CLOSED position, and the throttle valve was consistent with the engine being shut down; the engine mixture control was found against the FULL RICH stop, which was not consistent with the engine being shut down.

A guarded automatic feather switch, located on the pilot's pedestal, operates the feathering function for both propellers. This automatic feather switch was found in the DOWN position, and the guard was found impact-damaged but in the UP or unguarded position. The automatic feather switch in the DOWN position is consistent with it being in the UNARMED position.

The left propeller was found feathered, but the right propeller's pitch was consistent with a high rotation/takeoff power setting.

Airframe fire and thermal damage were found on the airplane's right wing rear spar, nacelle aft of the power section, and in the vicinity of the junction between the augmentor assemblies and the exhaust muffler assembly. Damage to the airframe extended from the right engine firewall aft to the flaps, with the damage greater on the outboard side compared to the

[14] Stall speeds are published for level flight, zero thrust, and a forward center of gravity (CG). The accident airplane was descending at over 1,000 ft per min with an undetermined CG as the airspeed decreased. A load factor of less than 1*g* and a more aft CG would both result in a lower stall speed. Power would also tend to lower the stall speed.

inboard side. The rear spar was intact with several areas of significant fire damage. Sooting was present on all of the rear spar aft surfaces, and the spar web exhibited evidence of burn-through in three areas concentrated toward the right side. The lower bulkhead that forms the aft end of the right wheel well remained attached, with several areas exhibiting heat damage. The right inboard flap had some melting and other heat-related signatures on the upper surface on the forward outboard corner, and sooting was present on the top surface of the flap; the inboard flap was otherwise intact. The inboard end of the right outboard flap exhibited fire damage, including a section of the attached flap track, as well as a section of the inboard edge that was missing and presumed destroyed in the fire. Damage to the remaining inboard portion of the right outboard flap extended about 14 in along the trailing edge and 28 in along the leading edge.

1.5 Medical and Pathological Information

1.5.1 Toxicology Testing

The toxicology reports for the captain and the first officer indicated no evidence of significant preexisting medical pathology. Toxicology testing, performed by the FAA's Civil Aerospace Medical Institute, detected the following ethanol levels for the captain: blood (27 mg/dL), brain (41 mg/dL), and muscle (26 mg/dL).

1.5.2 Crew Injuries

Postaccident examination of the accident site revealed the handheld radio and cord wrapped around the captain's left forearm. The first officer's autopsy revealed fractures to both radii and both ulnas and a fracture of the left femur.

1.6 FAA Oversight

The FAA certificate management office (CMO) located in Miramar, Florida (CMO-29), was responsible for oversight of Fresh Air, which was based in Davie, Florida. At the time of the accident, the principal operations inspector (POI), the principal maintenance inspector (PMI), and the principal avionics inspector (PAI) for the Fresh Air certificate were responsible for a total of 14 certificates (all Part 125 operations).

1.6.1 Records Oversight

Flight and duty time records allow the POI to verify a pilot's currency by ensuring the pilot has logged three takeoffs and landings within a 90-day period (per 14 CFR 125.285[a]) and also allow the POI to ensure that pilots comply with flight and duty time requirements and are not on duty for 8 consecutive hours during any 24-hour period (per 14 CFR 125.37). A review of pilot records at Fresh Air's main office found many pilot records incomplete or nonexistent.

The captain owned a home in St. Croix, and according to interviews with the FAA and the captain's son, the captain would fly to St. Croix to conduct maintenance on the Fresh Air airplanes and store required aircraft flight logs, maintenance records, and flight documents before mailing them to Fresh Air's office in Davie, Florida, on a weekly basis. While FAA airworthiness inspectors indicated that Fresh Air personnel were professional and provided all documentation requested during their inspections, Fresh Air was unable to provide the NTSB with numerous requested records, despite the issuance of a subpoena, including the following items:

- Copies of any training materials provided to Convair CV-440 pilots by Fresh Air or any contracted training program;
- First officer employment records (per GOM, chapter 3, page 2);
- Copy of the captain's FAA check airman letter of authority to conduct checkrides for Fresh Air (per FAA Order 8900.1, Chg 45, volume 3, section 3-1456);
- Evidence of authority from the POI to allow Tiger Contract Cargo pilots to conduct proficiency checks of Fresh Air pilots;
- Evidence of a check airman observation for the captain from 2005 through 2011, on either Fresh Air's Convair CV-440 or DC-4;
- Evidence of oral or written evaluation for 2011 for the captain on the Convair CV-440 (per 14 CFR 125.287[a]);
- Evidence of PIC competency check for 2011 for the captain on the Convair CV-440 (per 14 CFR 125.287[b]);
- Evidence of instrument proficiency for 2011 for the captain on the Convair CV-440 (per 14 CFR 125.291);
- Copy of Fresh Air's air carrier certificate;
- Status of aircraft (total flight hours and flight cycles at the time of the accident) and Fresh Air master log (flight and maintenance log);
- Status of all airworthiness directives (AD)/and SBs incorporated in the accident airplane;
- All engine and propeller maintenance records, including part and serial numbers, times since overhaul, and when removed/replaced;
- Listing of all supplemental type certificates incorporated on the accident airplane and when accomplished;
- Status of the continuous airworthiness maintenance program (for example, all times for when an A-, B-, C-, or D-check or an airframe, propeller, or engine overhaul was performed);
- List of all major repairs and alterations to the accident airplane;
- Status of all time-limited components on the accident airplane;
- Service difficulty reports submitted to the FAA, if any;
- Minimum equipment lists present during the accident flight, if any; and
- All mechanic training records.

Fresh Air's GOM, chapter 8, page 11, paragraph d, stated that the director of operations is responsible for retaining signed copies of the flight release/load manifests at the principle operations base for departing flights.[15] However, a company flight controller who was present during the loading of the accident flight indicated that the flight crew did not leave a copy of the weight and balance information for the accident flight and that "the pilots never left copies of the weight and balance." The POI said that Fresh Air used the flight logbook page as the flight release and that he received copies every 7 days from the operator after they were sent from the captain's St. Croix home to the base of operations in Davie, Florida. Fresh Air's GOM did not include a provision that allowed retaining the only copy of the flight manifest in the airplane then in St. Croix before sending it to Fresh Air's Davie, Florida, office. The POI noted that he had spoken to Fresh Air about its failure to leave behind required paperwork. The POI acknowledged that no Fresh Air agent was in SJU; thus, no Fresh Air agent could retain copies of the required paperwork at SJU as required by the GOM.[16]

1.6.2 Operational and Airworthiness Oversight

The FAA requires six annual airworthiness inspections on Part 125 operations: a ramp inspection, a spot inspection, an aircraft records inspection, an AD compliance inspection, a suspected unapproved parts procedures inspection, and an inspection of the operator's approved aircraft inspection program. Fresh Air's PMI and PAI had conducted all six of the required inspections the year before the accident and had completed three of the six for the year of the accident, including an aircraft records inspection 7 days before the accident. No airworthiness or recordkeeping deficiencies were noted during those inspections.

In addition, the FAA requires the following operational inspections for Part 125 certificates: a main base inspection, a ramp inspection, and a manual procedures inspection. The Fresh Air POI stated that he conducted the required main base and manual inspections at Fresh Air's Davie, Florida, office, which he considered their operational base. He did not conduct any ramp inspections on Fresh Air aircraft; all required ramp inspections were completed by flight standards district office (FSDO) personnel in San Juan. The POI had met the accident captain once and worked with the GM during inspections in Davie, Florida. According to FAA program tracking and reporting subsystem data for Fresh Air, the San Juan FSDO performed the last ramp inspection before the accident on February 18, 2011. Since 2006, nine ramp checks had been performed on Fresh Air Convair airplanes, six of which were on the accident airplane. The POI performed the last main base inspection, which included a review of pilot records and Fresh Air's GOM, before the accident on January 6, 2012. The POI also performed Fresh Air's last manual procedures inspection on January 6, 2012. The POI told investigators that he had never been to San Juan and had never ridden on or seen Fresh Air's airplanes.

[15] Title 14 CFR 125.405(d) states, "If a flight originates at a place other than the principal operations base of the certificate holder and there is at that place a person to manage the flight departure for the operator who does not depart on the airplane, signed copies of the documents…may be retained at that place for not more than 30 days before being sent to the principal operations base of the certificate holder."

[16] This is contrary to 14 CFR 125.405(e), which states that the certificate holder shall "Identify in its operations manual the person having custody of the copies of documents retained in accordance with paragraph (d) of this section."

Part 125 does not require line checks on the PIC, and FAA inspector guidance, per FAA Order 1800.56N, specifically notes that "The FAA does not require a cockpit en route inspection for scheduled cargo flights." However, both FAA[17] and Fresh Air[18] policies allow an FAA inspector to conduct an en route inspection. The POI told investigators that he had never requested an en route inspection on a Fresh Air airplane or on any of the Part 125 operators for which he had oversight authority. Instead, he relied on the pilot/company owner, the only FAA check airman at the company able to conduct authorization rides, to provide information about the operation.

1.6.3 Captain's Evaluation Under Lateral Moves Provision

Pilot competency checks are typically conducted by an FAA examiner or a check airman from the company that employs the pilot. However, because the captain was the only check airman at Fresh Air, he received his competency check from a check airman at Tiger Contract Cargo, a separate Part 125 certificate holder that Fresh Air had recently purchased. This was allowed under a lateral moves provision[19] in FAA inspector guidance. Because of the rarity of the airplane types typically operated under Part 125 (like the Convair) and the limited number of check airmen qualified to perform competency and instrument proficiency checks, pilots who received their 12-month competency and instrument proficiency check from one operator may receive credit for those checks with another operator. Such lateral moves evaluations are limited to Part 125 operations.

According to 14 CFR 125.287(a)(1), under the lateral moves provision, pilots are required to be tested on the "operations specifications and manual of the certificate holder." The manager of the FAA's Accident Investigation Division indicated after the accident that a pilot should be evaluated on the OpsSpecs and manual of the certificate holder that employs the pilot. However, the POI stated that he did not know whether, under the lateral moves provision, the captain would be evaluated on Fresh Air's or Tiger Contract Cargo's OpsSpecs and GOM for the Convair. The captain's evaluation in Fresh Air's DC-4 was conducted by a pilot from Florida Air Transport using Florida Air Transport's OpsSpecs, not Fresh Air's; the POI stated that the captain "was required to be evaluated on the Florida Air Transport OpsSpecs and operation manual."

1.6.4 Cargo Loading Procedures

Bread pallets were weighed before shipment on a certified and regularly calibrated scale at the Holsum facility and clearly marked with the palletized weight for loading. A Fresh Air flight coordinator said that loads came in from the bread company palletized and that they would then offload and reweigh them on a scale in the hangar next to the airplane. When the weights were different, the reweighed weight was given to the captain as the actual cargo weight.

[17] FAA Advisory Circular 125-1, "Operations of Large Airplanes Subject to Federal Aviation Regulations Part 125," addressed en route inspections for Part 125 operators.

[18] The Fresh Air GOM, chapter 4, page 10, authorized FAA inspector access to Fresh Air aircraft cockpits.

[19] The lateral moves provision is defined in FAA Order 8900.1, volume 5, chapter 2, section 10, "Conduct a 14 CFR Part 125 Pilot Competency or Instrument Proficiency Check."

The POI was unaware of this procedure used by Fresh Air and indicated, “I would want to know about it, but I relied on the information from San Juan who did the checks.” The investigation uncovered no evidence that Fresh Air’s cargo loading procedures were inspected during any ramp inspection, either by the POI or any FSDO ASI in SJU to whom he assigned ramp inspections, and none were required. Further, the investigation did not reveal any documentation that ensured that the Fresh Air scale was calibrated and accurate.

2. Investigation and Analysis

2.1 General

The weather on the morning of the accident (10 mi of visibility and a 5-knot wind from 120˚) was not a factor in the accident. ATC services provided to the accident flight, including after the flight crew declared an emergency, were sufficient and were not a factor in the accident. Additionally, the airport's response to the crash was both adequate and timely. This analysis will focus on the flight crew, the airplane, Fresh Air's operation of the airplane, and the FAA's oversight of Fresh Air.

2.2 Maximum Allowable Takeoff Weight

According to the Convair CV-440 AFM, the ADI system was required to be operative for all takeoffs at the maximum allowable takeoff weight. The Convair CV-440 also had an autofeather system that automatically feathered the propeller in the event of an engine failure. Feathering the propeller on a failed engine decreases drag, assisting the flight crew with single-engine operation. For airplanes like the Convair CV-440, it is critical that the ADI and autofeather systems are operative for each takeoff to ensure that the engines are optimized for maximum performance in the event of an engine failure or in-flight shut down.

Because the accident airplane had no flight data recorder to verify use of the ADI or autofeather systems on the accident flight, the NTSB interviewed former Fresh Air pilots who flew with the captain to understand how he typically used the systems on takeoff. The pilots indicated that the accident captain did not generally use either the ADI or the autofeather systems, and one pilot noted that the autofeather system on the accident airplane was not operative since the circuit breaker was pulled.[20] Additionally, the Fresh Air GM told investigators that the captain would likely have had the autofeather off during the accident flight.

Using documentation of the cargo weight provided by Holsum, the NTSB estimated that the ramp weight of the airplane for the accident flight was 47,710 lbs and that the takeoff weight was 47,510 lbs.[21] The Convair CV-440 AFM allows a maximum takeoff weight of 48,000 lbs with the ADI system armed and 40,900 lbs with the ADI system unarmed. The maximum allowable operating weight for a takeoff with the autofeather system inoperative was 43,500 lbs. Thus, the takeoff weight of 47,510 lbs would have required that both the ADI system be armed and the autofeather system be on for takeoff. However, the autofeather switch was in the UNARMED position. The NTSB concludes that based on the captain's history of ADI and autofeather nonuse and the postaccident position of the autofeather switch, the flight crew likely did not use the ADI and autofeather systems during the takeoff; as a result, the accident airplane exceeded the maximum allowable takeoff weight of 40,900 lbs.

[20] Due to impact damage, the investigation was unable to determine the state of the autofeather circuit breaker.

[21] Because of the absence of weight and balance paperwork, investigators were unable to determine the exact weight of the accident airplane at takeoff.

2.3 Return to the Airport

The airplane lifted off normally; however, within 2 min, the first officer contacted the departure controller to declare an emergency, and the captain then requested a left turn back to the airport. Following the announcement of an emergency after takeoff, the captain contacted the tower controller to ask if the controller saw smoke. The tower controller confirmed the transmission but did not see any indication of smoke. Pilots flying multiengine aircraft are generally trained to shut down the engine experiencing a problem and feather that propeller; thus, the flight crew likely intended to shut down the right engine[22] by bringing the mixture control lever to the IDLE CUTOFF position and feathering the right propeller, as called out in the Engine Fire In Flight checklist. This would have left the flight crew with the left engine operative to return to the airport. However, postaccident examinations revealed that the left propeller was found feathered at impact, with the left engine settings consistent with the engine at takeoff or climb setting. The right engine settings were generally consistent with the engine being shut down; however, the right propeller's pitch was consistent with a high rotation/takeoff power setting. Had the autofeather system been ARMED, the right propeller would have automatically started the feathering process and, simultaneously, a blocking relay would be energized, preventing the left propeller from feathering. Because the autofeather system was not activated, the flight crew had to manually feather the propeller and likely manually selected the left propeller to feather at some point before impact with the water.

The accident airplane was not equipped with a flight data recorder or a cockpit voice recorder (nor was it required to be so equipped); hence, the investigation was unable to determine at what point in the accident sequence the flight crew shut down the right engine and at what point they feathered the left propeller, or why they would have done so. Other Convair pilots described the airplane as only holding altitude at best on a single engine and when heavily loaded. As noted earlier, the airplane was above the maximum allowable takeoff weight, making it even more difficult for the flight crew to maintain altitude or airspeed when operating with one engine. Radar data indicate that the airplane continued to climb at greater than the single-engine climb speed until the tower controller cleared the flight to land after the flight crew declared an emergency, indicating that the right engine was likely not shut down until the airplane was cleared to land. The radar data then indicate a relatively steady decline in altitude until the final right turn to align with runway 28. The calculated airspeed on the accident flight was around 140 knots when the airplane began to bank to the right to line up with runway 28, but then decreased during the right turn. The NTSB concludes that although the flight crew feathered the left propeller at some point during the return to the airport, the feathering likely occurred late in the accident sequence because the flight profile indicates that at least one engine was generating thrust until near the end of the flight.

When operating with a single engine, the loss of the other engine's thrust introduces an asymmetry that needs to be counteracted by pilot input. The rudder is used to offset the yaw from the engine thrust asymmetry; additionally, in the process of countering the yaw from the lack of thrust from one engine, roll effects are also introduced that the pilot must also control for. Pilots must always maintain a flying speed above the minimum controllable airspeed, V_{mc}, to ensure

[22] Although the investigation was not able to determine why the crew chose to shut down the engine, they likely suspected an engine fire due to the smoke.

effectiveness of the rudder and maintain positive control of the airplane. According to the Convair CV-440 AFM, at an altitude just above msl and for the maximum gross weight of the accident airplane, V_{mc} is 87 knots. Additionally, V_{mc} is sensitive to bank angle; the V_{mc} referenced in the AFM is determined using no greater than 5˚ of bank angle into the operating engine.

Radar data show that as the airplane was heading south at an altitude of about 520 ft, it began a descending turn to the right to line up with runway 28. As the airplane reached a calculated bank angle of 30˚ right-wing-down, the calculated airspeed remained between 120 and 140 knots. The bank angle then reduced and the airplane leveled off near 200 ft; however, the calculated airspeed continually dropped as the airplane reduced its bank angle to stop the turn and align with the runway. At the end of the recorded radar data, the airplane was close to both aerodynamic stall and the controllability limit for one-engine-inoperative flight. Radar contact was lost with the airplane at 100 ft as it continued the right turn; shortly thereafter, the airplane struck trees with its right wingtip and crashed into the lagoon while traveling in a northerly direction. The NTSB concludes that the airspeed of the airplane reduced to a point where the airplane either experienced an aerodynamic stall or it dropped below the minimum control speed during the right turn to align with runway 28.

Postaccident examination of the airplane indicated fire and thermal damage to the airframe on the airplane's right wing rear spar, the right engine nacelle aft of the power section, and in the vicinity of the junction between the augmentor assemblies and the exhaust muffler assembly. All of the fire and thermal damage was located aft of the engine and the fire detection/warning system installed on the airplane. Additionally, the condition of the paint on the upper right wing skin within the nacelle area was consistent with long-term exposure to high heat exceeding normal operation. The paint discoloration and lack of oil residue on the right augmentors when compared to the left augmentors and when compared with augmentors from an exemplar airplane indicated that the right side was exposed to much higher temperatures than the left side. While the investigation could not determine the exact location of the ignition source, it appears to have been aft of the engine in the vicinity of the junction between the augmentor assemblies and exhaust muffler assembly.

Statements from mechanics familiar with this type of airplane indicate exhaust fires do occur in the augmentors on this type of aircraft. Under normal conditions, the fire is exhausted out the muffler assembly, resulting in little or no damage to the aircraft. A fire leaking out of the augmentor assembly at the junction with the muffler assembly would have produced the damage that was found on the accident aircraft. Although the source of fuel for the fire could not be determined, oil or fuel leaks into the exhaust system are capable of igniting in the presence of the high heat within the augmentors and would have led to the exhaust fire. Thus, the NTSB concludes that the thermal damage to the airplane resulted from the ignition of a flammable liquid in one of the right augmentors, and a leak in the vicinity of the augmentor/muffler junction allowed the fire to exit the junction and damage portions of the right wing.

Of note is that the captain witnessed a Tiger Contract Cargo Convair engine fire after takeoff from St. Thomas in January of 2011. The captain was flying over St. Thomas at the time; he witnessed the engine fire and radioed the pilot to land as soon as possible. NTSB investigators who examined the St. Thomas Convair characterized the engine fire experienced on the

St. Thomas Convair as extensive, and the captain may have recalled the severity of that event when he experienced this engine fire, which could have affected his decision-making. While postaccident examination of the airplane from the San Juan accident indicated that the engine fire appeared to be less severe than the previous event, the flight crew would not have been aware of its severity during the flight.

2.4 Human Performance

2.4.1 Flight Crew Roles

The investigation attempted to determine who was the pilot flying (PF) and who was the pilot monitoring (PM) on the accident flight. According to interviews with other Fresh Air pilots who flew with the accident captain, the captain typically flew the outbound flight loaded with cargo because it was the heaviest, and the first officer typically flew the return leg, which was usually empty. No evidence suggests that this flight warranted a different assignment of pilot duties, particularly because the first officer had only recently received Convair retraining 2 weeks earlier after Fresh Air rehired him. Fresh Air's GM (the captain's son) stated that the first officer made the initial transmission to ATC declaring an emergency, indicating that the captain was initially the PF and the first officer was handling communications. However, after the emergency declaration, the captain made all further communications with ATC, and the injuries incurred by the flight crew at impact[23] were consistent with the first officer flying and the captain handling radio communications. The investigation was therefore unable to determine why the captain allowed the first officer to fly the airplane when faced with an emergency. However, the captain, as the PIC, was ultimately responsible for the operation of the airplane.[24]

The first officer received his commercial airplane multiengine land and instrument certificate in 2001. As noted earlier, between 1996 and 2008, the first officer received five notices of disapproval for his flight training. The first officer began pilot training (ground school) at Seaborne Airlines in early 2009 but did not successfully complete simulator training and was not hired by the company. At the time of the accident, the first officer had about 700 hours as SIC in the Convair CV-440. He had accrued 16 hours in the Convair CV-440 in the 30 days before the accident but had accrued no additional flight time in the 12 months before the accident. The NTSB concludes that flight crew injuries were consistent with the first officer flying the airplane at the time of impact; however, considering the first officer's limited recent experience in the Convair CV-440 and the performance deficiencies identified in his training and certification history, he was likely not capable of handling the emergency without help from the captain.

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[23] The first officer sustained fractures to both radii and both ulnas and also a fracture of the left femur, indicating that he was likely flying the airplane at the time of impact; the captain was found with the airplane's microphone and cord wrapped around his left forearm, suggesting that he was handling communications at the time of impact.

[24] Title 14 CFR 91.3 states that "The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft."

2.4.2 The Role of Fatigue/Impairment

Toxicology testing detected a blood ethanol level of 27 mg/dL for the captain. Title 14 CFR 91.17(a) prohibits any person from acting or attempting to act as a crewmember of a civil aircraft while having 40.0 mg/dL or more ethanol in the blood. Although the amount of ethanol detected in the captain's blood was below the maximum level stated in 14 CFR 91.17(a), adverse clinical symptoms have been noted with blood ethanol levels as low as 20.0 mg/dL (Ogden and Moskowitz 2004, 185-198). Accordingly, the investigation sought to determine whether some or all of the ethanol detected was from postmortem decomposition or if some was from ingestion and may have impaired the captain's decision-making during the accident sequence. The captain's activities on the night before the accident are not known with sufficient resolution to determine whether he ingested alcohol. However, because of the varied ethanol levels in the captain's tissue,[25] the ethanol was not likely from ingestion.

Although an in-flight fire was an emergency situation, a flight crew applying effective crew resource management, adhering to their PF and PM duties, and properly using a checklist to handle the emergency should have been able to maintain positive control of the airplane. Flight crews encountering emergency situations, such as on this flight, are frequently faced with high levels of stress due to workload and time pressures, among other factors, and may make errors or face performance limitations directly linked to human cognitive limitations. Although moderate stress can improve performance, errors and performance degradations occur when a pilot experiences high stress and becomes overloaded. Research indicates that a pilot may focus on a narrow piece of information that is perceived to be most threatening or salient and exclude other important information (Wickens 1984, 417). For example, stress can lead to a phenomenon known as "tunnel vision," or the narrowing of attention, in which basic information like airspeed can be overlooked as the scan of all environmental cues may be restricted.

To determine why an experienced captain allowed the airplane's airspeed to fall so low, the NTSB reviewed the limited available data to evaluate fatigue as a factor degrading the flight crew's performance. Conditions that can lead to the development of a fatigued state include chronic or acute sleep loss,[26] circadian disruption, and extended time since awakening.[27] Circadian disruption and extended time since the flight crew awoke were not factors in this accident. Specifically, the accident occurred about 0740, a time not typically indicative of

[25] The ethanol level in the captain's brain was 41 mg/dL, and the ethanol level in his muscle was 26 mg/dL. Ethanol ingested by live individuals is distributed symmetrically throughout the body. Therefore, postmortem tests reflecting ingestion are very similar across different tissues. After death, ethanol can be produced by microbial action in the body's tissues; results from this production tend to vary quite widely from one tissue to the next.

[26] Acute sleep loss occurs when a person has total or partial sleep loss for no more than several days.

[27] The NTSB's 1994 study of flight crew-related major aviation accidents indicated that fatigue related to length of time since awakening may be related to errors made by flight crewmembers. The NTSB found that crews that had extended time since awakening (over 13 hours awake) made an average of 40% more errors than crews that did not have extended time since awakening (about 5 hours awake). Further, research into quantifying performance impairment associated with sustained wakefulness found that performance remains relatively stable throughout the time that coincides with a normal waking day but that prolonged wakefulness of 17 hours can result in measurable performance impairment comparable to having a blood alcohol concentration of 0.05% or higher (Dawson and Reid 1997, 235; Lamond and Dawson 1999, 255-262).

reduced alertness due to circadian disruption. Cell phone records indicate that the captain had likely been awake about 4 hours at the time of the accident, so performance degradation resulting from an extended time since awakening was ruled out. Because of the limited data available, the investigation could not establish if the captain accumulated a chronic sleep debt beyond the 72 hours before the accident; based on cell phone records, he had adequate opportunity to sleep on March 12 and 13.

The captain's normal sleep pattern was not available. However, the day before the accident flight, the captain made and received multiple phone calls and text messages from about 1147 until about 2343. While it is possible that he took advantage of a break in cell phone activity to sleep between about 2208 and about 2342, his sleep would have been less than 90 min in duration, as he checked his voicemail about 2343. Further, the captain received a call about 0343 on the morning of the accident, giving him an uninterrupted sleep opportunity of only 4 hours the night before the accident flight, which is less than the average of 7 to 9 hours of sleep that adults typically need per night (National Sleep Foundation 2014). The captain was likely experiencing 3 to 5 hours of sleep loss at the time of the accident. Cell phone activity and flight logs from the captain's flight from St. Croix to San Juan on the morning of the accident indicate that there were no additional opportunities for sleep before the flight. Scientific research and accident investigations have recognized the negative consequence of fatigue on human performance and as few as 2 hours sleep loss can lead to performance decrements (Carskadon and Roth 1991, 155-167). Even if the captain had taken advantage of the two sleep opportunities, the combined sleep is less than the average sleep needed for adults and fragmented sleep is less restorative than unfragmented sleep (Steptanski 2002, 268-276). Fatigue can cause reduced alertness and degraded mental and physical performance, such as slowed response time, a breakdown in vigilance, degraded decision-making and risk assessment, and reduced leadership (Caldwell 1997, 932-938; Haslam 1984, 216-221; Kruger 1989, 129-141; NTSB 2011; and NTSB 2006). Specifically, this sleep loss would have led to degraded decision-making, inadequate risk assessment, and reduced leadership, all skills that would have been critical during the accident sequence. Given the minimal amount of time the flight crew had to process the emergency and the overweight airplane with neither the ADI nor autofeather systems armed during takeoff, the captain would have had to assess the emergency and act quickly and appropriately to address it. Further, with a first officer who had relatively little recent time in the Convair as the PF, the need for the captain's clear, unimpeded leadership would have been critical. The NTSB concludes that the captain was likely suffering from acute sleep loss at the time of the accident, which would have negatively affected his ability to guide the first officer in properly handling the emergency.

According to the first officer's cell phone records, on March 14, the first officer made and received multiple calls and text messages between about 1030 and about 2255. On March 15, cell phone activity began about 0505, providing a sleep opportunity of about 6 hours. He made and received multiple calls and text messages until about 0719, with a break in activity from about 0556 until about 0659. The first officer did not likely use this time as a sleep opportunity, as the Fresh Air GOM states that pilots should arrive 1 hour before the scheduled departure time; the first officer was likely commuting to and arriving at the airport during this break. The first officer's normal sleep pattern was not available, so it is not possible to know if the limited sleep opportunity was unusual; however, it is likely that he was experiencing 1 to

3 hours of sleep loss at the time of the accident. Because of the limited information available and his relative inexperience in the accident airplane, the investigation was unable to determine the extent to which fatigue played a role in the first officer's performance at the time of the accident.

2.5 FAA Oversight

The FAA CMO for Fresh Air was located in Miramar, Florida. At the time of the accident, the POI, PMI, and PAI for the Fresh Air certificate were all located in Orlando, Florida. The FAA requires three operational inspections on a Part 125 certificate holder each year: a main base inspection, a manual procedures inspection, and a ramp inspection. Fresh Air's POI conducted all required main base and manual procedures inspections (including a review of pilot records and the GOM) at Fresh Air's Davie, Florida, office, with the most recent inspections occurring on January 6, 2012. The San Juan FSDO performed the last ramp inspection before the accident on February 18, 2011.

A review of the captain's duty time records found numerous discrepancies, inaccuracies, and missing information. In addition, Fresh Air was unable to verify that the captain had successfully completed his annual competency check in the 12 months before the accident, as required by 14 CFR 125.401. Records indicate that on June 24, 2010, the captain received a 12-month Part 125 competency check[28] in the Convair CV-440 from a Tiger Contract Cargo check airman. This competency check would have allowed him to operate the Fresh Air Convair CV-440 as PIC for 12 calendar months (until June 30, 2011). The captain should have received an annual competency check at some point between March 1, 2011, and March 15, 2012, to be current for the accident flight. There was no record that such a check occurred or that an instrument proficiency check had been completed.

Fresh Air's GM incorrectly assumed that one checkride covered both scenarios because he believed that competency checks and check airmen observations could be combined. A competency check requires the pilot to physically manipulate the controls of the airplane and may include any of the maneuvers and procedures currently required for the original issuance of the particular pilot certificate or rating required for the operations authorized and appropriate to the category, class, and type of airplane involved. A check airman evaluation flight, required every 2 years in the specific type of airplane in which the pilot plans to conduct evaluations, is considered to be a practical test of the check airman's ability to test other airmen, not his flying ability. The POI failed to discover the anomaly. The investigation did not find any documentation showing that the accident captain was current to operate as PIC under the provisions of Part 125.

Despite the FAA's recent aircraft records inspection and Fresh Air's cooperation, the investigation was unable to locate current documentation related to the accident airplane's status, including AD and SB compliance, engine and propeller records, applicable supplemental type certificates, major airplane repairs and alterations, the status of time-limited components, service

[28] Title 14 CFR 125.287(b) requires each pilot receive a competency check every 12 calendar months, and 14 CFR 125.291(a) requires the PIC to receive an instrument proficiency check every 6 calendar months. The instrument proficiency check required by 14 CFR 125.291 may be substituted for the competency check required by this section for the type of airplane used in the check.

difficulty reports, minimum equipment lists, or continuous airworthiness maintenance program information. Additionally, Fresh Air was unable to provide current mechanic training records. As noted earlier, the investigation relied on physical evidence from the wreckage to determine that modifications associated with SB 340-144B, which permits operation of the Convair CV-340 in accordance with the performance limitations contained in the Convair CV-440 AFM, were incorporated on the accident airplane.

The NTSB acknowledges that the certificate holder (Fresh Air) has the responsibility to maintain current records of its flight crewmembers and aircraft. However, the FAA's required annual inspections of each certificated operator include a review of pilot records and currency and of aircraft maintenance records. During the last documented main base inspection before the accident, the POI should have discovered the recordkeeping discrepancies and instructed the operator to verify the captain's currency. Likewise, the PMI should have discovered Fresh Air's critically deficient recordkeeping during the last documented aircraft records inspection, conducted 7 days before the accident, or during any of the six inspections that the PMI and PAI conducted in the year before the accident. Thus, the NTSB concludes that Fresh Air failed to keep accurate and complete records, and the FAA did not address Fresh Air's deficient recordkeeping; thus, the FAA's oversight of Fresh Air's recordkeeping was inadequate.

Additionally, although Fresh Air operated cargo flights, the investigation found no evidence that its cargo loading procedures were inspected during any Fresh Air ramp inspection, either by the POI or any FSDO ASI in SJU to whom the POI assigned ramp inspections. Apparently unknown to the FAA, Fresh Air would reweigh pallets that arrived at the airport after being unloaded from the Holsum truck and before being loaded on the airplane, even though the pallets were weighed on a certified and regularly calibrated scale at Holsum. While this procedure to reweigh the pallets could be helpful when a pallet had to be broken down, Fresh Air reweighed all pallets, and the weight was given to the captain as the actual weight of the cargo. The investigation did not reveal any documentation ensuring the Fresh Air scale was calibrated and accurate. Thus, the pilots may not have been using appropriate weight information when calculating the airplane's weight and balance, further reducing their margin of safety. The POI was unaware of this Fresh Air procedure. Although Fresh Air's cargo loading procedures did not contribute to the accident, the FAA failed to detect and address discrepancies between Fresh Air's approved procedures and operational reality, including cargo loading, pilot currency, company recordkeeping, and pilot evaluation.

Effective oversight of Part 125 operations also relies on complete and thorough inspections of an operator's recordkeeping and compliance with its own and FAA procedures. Multiple FAA inspectors visited the operation but failed to detect or address a litany of issues, including deficient pilot and maintenance recordkeeping and unapproved cargo loading procedures. During the investigation, the NTSB found evidence suggesting that oversight of Part 125 operations was not seen as a priority. For example, Fresh Air's POI told investigators that Part 125 was generally "a GA [general aviation] operation," not an air carrier operation. While most of their flights were relatively close to San Juan, Fresh Air's OpsSpecs authorized it to operate commercially over the 48 contiguous states, meriting far more scrutiny than "a GA operation." Another former Part 125 POI told investigators that Part 125 "has always been a loose regulation" because they are normally cargo operations and "not a big threat to the public." Combined with the basic gaps in oversight by multiple FAA inspectors related to Fresh Air's cargo loading, pilot currency, company recordkeeping, and pilot evaluation practices, such statements indicate an ineffective oversight regimen for Part 125 operations. As Fresh Air's POI told investigators, "we need more oversight for these types of operators to promote a safety culture." The NTSB concludes that multiple FAA inspectors failed to perform effective oversight of Fresh Air, possibly due to a belief that Part 125 operations merit less scrutiny than Part 121 and 135 operations, despite the fact that the airplanes fly over populated areas within the national airspace system. Therefore, the NTSB recommends that the FAA evaluate the effectiveness of its Part 125 oversight program and ensure that Part 125 operations are conducted at the same level of safety as that of Parts 121 and 135.

2.6 En Route Inspections

Since 2007, when the POI began his oversight of Fresh Air, FAA personnel did not conduct any line checks or en route inspections on any Fresh Air airplane. As noted earlier, the POI relied on main base and manual procedures inspections at Fresh Air's main office in Davie, Florida, to review Fresh Air's pilot records, maintenance records, and manuals. When asked how he would know if Fresh Air was flying in accordance with its GOM, OpsSpecs, and the Convair CV-440 AFM, the POI said that he relied on the pilot/owner of the company, who was the only FAA check airman to conduct authorization rides, to provide information about the operation. He added that regular line checks are also important but also stated that he never conducted any. However, there is no evidence that the POI asked the SJU FSDO to verify Fresh Air's operational compliance with its manuals.

En route inspections provide the FAA an opportunity to verify that an operation complies with operational regulations, the operator's FAA-approved procedures, and the limitations outlined in the FAA-approved AFM. Operations conducted under 14 CFR Parts 135 and 121 incorporate these annual en route inspections into their line checks, which include an observation of the PIC to ensure that the PIC satisfactorily performs his or her duties and responsibilities under the regulations.[29] However, Part 125 does not require the FAA to conduct en route inspections on Part 125 operators to accomplish similar compliance verification. Both FAA[30] and Fresh Air[31] policies allow for an FAA inspector to conduct an en route inspection; however, FAA inspector guidance, in FAA Order 1800.56N, specifically notes that "The FAA does not require a cockpit en route inspection for scheduled cargo flights."

[29] In its report discussing the July 31, 2008, accident involving a Hawker Beechcraft 125-800A that crashed while attempting to go around after landing in Owatonna, Minnesota, the NTSB issued Safety Recommendation A-11-30, which asked the FAA to require that Part 135 PIC line checks be conducted independently from other required checks and be conducted on flights that represent typical revenue operations. The NTSB classified Safety Recommendation A-11-30 "Closed—Unacceptable Action" on November 7, 2013, after the FAA replied that it had reviewed its existing policy and guidance to POIs regarding PIC line checks and that the implications of the recommended action on inspector workload would be logistically problematic and would increase the FAA's workload.

[30] FAA Advisory Circular 125-1, "Operations of Large Airplanes Subject to Federal Aviation Regulations Part 125," addressed en route inspections for Part 125 operators.

[31] The Fresh Air GOM, chapter 4, page 10, authorized FAA inspector access to Fresh Air aircraft cockpits.

En route inspections are a critical part of the FAA oversight responsibility to ensure that pilots and the operator properly adhere to the operational limitations and procedures outlined in the certificate holder's FAA-approved GOM and AFM. It is of little value for the FAA to ensure that an operator complies with proper pilot records and manual requirements if the FAA does not ensure that flight crews are applying those procedures and limitations during the actual operation of the airplane. A former Part 125 POI told the NTSB, "there would be no way to know if an operator was operating in accordance with their OpSpecs and flight manual limitations unless you visited the operation in person and conducted en route observations." Ultimately, the POI was responsible for the operational oversight of Fresh Air. In this case, Fresh Air pilots were operating the accident airplane contrary to the AFM by operating with the autofeather system disconnected and the ADI system off, yet using the higher gross takeoff weight than permitted with these systems off. Therefore, the NTSB concludes that because the POI had never directly observed Fresh Air's operation, he was unaware that the airplanes were being operated contrary to the limitations outlined in the FAA-approved AFM. Thus, the NTSB recommends that the FAA require all POIs of Part 125 certificate holders to conduct at least one en route inspection annually on each airplane type operated by the certificate holder.

2.7 Evaluation of Pilot Knowledge

An FAA examiner or a check airman from the company that employs the pilot typically performs instrument proficiency and Part 125 competency checks, and 14 CFR 125.287(a)(1) requires that pilots be tested on the "operations specifications and manual of the certificate holder." However, because of the rarity of the airplane types typically operated under Part 125 (such as the Convair CV-440) and the limited number of check airmen qualified to perform these checks, pilots who received their 12-month required competency and instrument proficiency check from one operator could receive credit for those checks with another operator. According to the FAA, this was allowed under a lateral moves provision defined in FAA inspector guidance.[32]

During its investigation, the NTSB noted confusion among operators and FAA personnel regarding the applicable OpsSpecs that check airmen must use during certain checkrides made under the lateral moves provision. While it unlikely affected the captain's capability to handle the accident, his competency check was not necessarily conducted using Fresh Air's OpsSpecs or GOM. Because the captain of the accident flight was the only check airman at Fresh Air, he received his competency check on the Convair from a check airman at Tiger Contract Cargo, a separate Part 125 certificate holder that Fresh Air had recently purchased. While the investigation could not determine under which company's OpsSpecs and operations manual the captain was evaluated for the Convair CV-440, Fresh Air's POI stated that for the captain's DC-4 evaluation, he "was required to be evaluated on Florida Air Transport's OpsSpecs and operation manual."

The lateral moves provision does not clarify whether the pilot should be evaluated on the OpsSpecs and manual of the certificate holder of the check airman or of the certificate holder

[32] The lateral moves provision is defined in FAA Order 8900.1, volume 5, chapter 2, section 10, "Conduct a 14 CFR Part 125 Pilot Competency or Instrument Proficiency Check."

that employs the pilot. In response to an NTSB inquiry, the FAA stated that the pilot should be evaluated on "the operation specifications and manual of each certificate holder that employs the pilot." However, FAA guidance on the proper OpsSpecs and manuals to be used during a checkride is not clear, as evidenced by the Fresh Air POI's belief that Florida Air Transport could conduct a lateral moves checkride on a Fresh Air pilot using Florida Air Transport's OpsSpecs and manuals. The NTSB concludes that the FAA failed to ensure that the captain had been evaluated on his knowledge of Fresh Air's OpsSpecs in the 12 months before the accident and that the FAA's inspector guidance did not specify that pilots evaluated under the Part 125 lateral moves provision be evaluated on the OpsSpecs of the certificate holder that employs the pilot. Therefore, the NTSB recommends that the FAA require check airmen who evaluate pilots under the Part 125 lateral moves provision to use the OpsSpecs of the certificate holder employing the pilot who is receiving the proficiency check to ensure a proper evaluation of the pilot's knowledge of these specifications.

3. Conclusions

3.1 Findings

1. Based on the captain's history of antidetonation injection (ADI) and autofeather nonuse and the postaccident position of the autofeather switch, the flight crew likely did not use the ADI and autofeather systems during the takeoff; as a result, the accident airplane exceeded the maximum allowable takeoff weight of 40,900 lbs.

2. Although the flight crew feathered the left propeller at some point during the return to the airport, the feathering likely occurred late in the accident sequence because the flight profile indicates that at least one engine was generating thrust until near the end of the flight.

3. The airspeed of the airplane reduced to a point where the airplane either experienced an aerodynamic stall or it dropped below the minimum control speed during the right turn to align with runway 28.

4. The thermal damage to the airplane resulted from the ignition of a flammable liquid in one of the right augmentors, and a leak in the vicinity of the augmentor/muffler junction allowed the fire to exit the junction and damage portions of the right wing.

5. Flight crew injuries were consistent with the first officer flying the airplane at the time of impact; however, considering the first officer's limited recent experience in the Convair CV-440 and the performance deficiencies identified in his training and certification history, he was likely not capable of handling the emergency without help from the captain.

6. The captain was likely suffering from acute sleep loss at the time of the accident, which would have negatively affected his ability to guide the first officer in properly handling the emergency.

7. Fresh Air failed to keep accurate and complete records, and the Federal Aviation Administration (FAA) did not address Fresh Air's deficient recordkeeping; thus, the FAA's oversight of Fresh Air's recordkeeping was inadequate.

8. Multiple Federal Aviation Administration (FAA) inspectors failed to perform effective oversight of Fresh Air, possibly due to a belief that Part 125 operations merit less scrutiny than Part 121 and 135 operations, and despite the fact that the airplanes fly over populated areas within the national airspace system.

9. Because the principal operations inspector had never directly observed Fresh Air's operation, he was unaware that the airplanes were being operated contrary to the limitations outlined in the Federal Aviation Administration-approved airplane flight manual.

10. The Federal Aviation Administration (FAA) failed to ensure that the captain had been evaluated on his knowledge of Fresh Air's operations specifications (OpsSpecs) in the 12 months before the accident and the FAA's inspector guidance did not specify that pilots evaluated under the Part 125 lateral moves provision be evaluated on the OpsSpecs of the certificate holder that employs the pilot.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the flight crew's failure to maintain adequate airspeed after shutting down the right engine due to an in-flight fire in one of the right augmentors. The failure to maintain airspeed resulted in either an aerodynamic stall or a loss of directional control.

4. Recommendations

As a result of this investigation, the National Transportation Safety Board makes the following recommendations to the Federal Aviation Administration:

> Evaluate the effectiveness of your 14 *Code of Federal Regulations* (CFR) Part 125 oversight program and ensure that 14 CFR Part 125 operations are conducted at the same level of safety as that of Parts 121 and 135. (A-14-110)
>
> Require all principal operations inspectors of 14 *Code of Federal Regulations* Part 125 certificate holders to conduct at least one en route inspection annually on each airplane type operated by the certificate holder. (A-14-111)
>
> Require check airmen who evaluate pilots under the 14 *Code of Federal Regulations* Part 125 lateral moves provision to use the operations specifications of the certificate holder employing the pilot who is receiving the proficiency check to ensure a proper evaluation of the pilot's knowledge of those specifications. (A-14-112)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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Acting Chairman

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Member

MARK R. ROSEKIND
Member

EARL F. WEENER
Member

Adopted: November 17, 2014

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