



**PARTY SUBMISSION
OF
ATLAS AIR, INC.**

**INVESTIGATION OF ATLAS AIR FLIGHT 3591
TRINITY BAY, HOUSTON, TEXAS
FEBRUARY 23, 2019**

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Introduction

On February 23, 2019, Atlas Air flight 3591 crashed in Trinity Bay, Texas, approximately 34 miles from George Bush International Airport (IAH) in Houston, Texas.¹ The record shows that the crash was the result of spatial disorientation and, specifically, the somatogravic illusion.

While descending from approximately 10,000 feet to 3,000 feet, one of the pilots activated the Boeing 767's go-around mode by pressing a Take Off/Go-Around switch mounted on the center column as the aircraft entered a thick cloud formation. Believing the aircraft to be pitching upward, the First Officer commanded the airplane to descend sharply. It is unclear whether the First Officer's disorientation occurred before or because of the activation of go-around mode. The Captain was communicating with air traffic control at Houston at that time and did not recognize the situation for several seconds. By the time that the First Officer recovered from spatial disorientation upon emerging from the cloud layer, there was not enough time to recover.

Atlas Air has flown into IAH uneventfully for more than 20 years—including multiple flights into IAH as early as 2016 by the Captain and First Officer of flight 3591—and Atlas Air crews routinely navigate challenging meteorological conditions. Spatial disorientation has been a leading cause of accidents for decades, and it affects pilots regardless of a pilot's proficiency or experience. Factors that increase the likelihood of spatial disorientation and, specifically, the somatogravic illusion—a lack of visual reference, head movements, turbulence, and accelerations (including the acceleration caused by the activation of the go-around mode)—were all present during the accident sequence.

1. Factual Information

1.1 History of Flight

On February 23, 2019, at 12:39 p.m. Central Standard Time (CST), Atlas Air flight 3591, a Boeing 767-375BCF, crashed into a marshy bay area approximately 34 miles from its destination, George Bush Intercontinental Airport (IAH) in Houston, Texas.² The flight was a domestic cargo flight from Miami International Airport (MIA) and was operated under the provisions of 14 Code of Federal Regulations Part 121. All three persons on board suffered fatal injuries, and the airplane was completely destroyed.

¹ Atlas Air, Inc. is a wholly owned subsidiary of Atlas Air Worldwide Holdings. It is a cargo airline, passenger charter airline, and aircraft lessor based in Purchase, New York.

² Dkt. 1, Operational Factors/Human Performance Group Factual Report at 5.

At the time of the accident, the First Officer was the pilot flying and the Captain was the pilot monitoring.³ The non-revenue passenger was a current EMB-175 captain for another air carrier.⁴

1.2 Atlas Hiring and Training

1.2.1 Hiring Process

Atlas pilot applicants first apply through an Applicant Tracking System or by sending resumes directly to the airline.⁵ After conducting an initial review to ensure the applicant meets the minimum pilot requirements, a recruiter contacts the applicant for an initial telephone screening interview, after which an in-person interview is scheduled for selected candidates.⁶

Atlas Air conducts new pilot interviews with Atlas Air flight operations management pilots, human resource personnel, and flight operations team and technical panel team pilots.⁷ Applicants are scored on a rating sheet by the personnel panel and technical panels separately before both panels meet to discuss each applicant and decide if the candidate will be offered employment.⁸ The personnel panel rates candidates on factors such as overall organizational fit, employment history, CRM/personality/assertiveness, training history, and experience level.⁹ The technical panel conducts a 20 to 30 minute review of the applicant's technical skills, general knowledge level, and trainability.¹⁰

Applicants are rated as Highly Recommended, Recommended, or Do Not Recommend for employment.¹¹ Applicants that pass both the personnel and technical panels are generally offered employment.¹² The process is controlled by Atlas's Director of Human Resources and Senior Director of Flight Procedures and Training, with all final decisions being made by human resources and flight operations together.¹³

Once a candidate is selected and accepts an offer of employment, Atlas begins the process of collecting and reviewing records mandated by the Pilot Records Improvement Act

³ *Id.* at 10–11.

⁴ *Id.* at 16.

⁵ *Id.* at 27.

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

¹² *Id.*

¹³ *Id.*

(PRIA).¹⁴ Since at least 2014, Atlas has contracted with TruView BSI, LLC (previously named Summit Security Services, Inc.) as its designated agent for PRIA and background screening services.¹⁵ As further detailed below, Atlas (through its designated agent) requests PRIA records, including the last five years of training records for any relevant carrier—the maximum permitted by PRIA—as well as the records held by the Federal Aviation Administration (FAA) and the National Driver Registry.¹⁶ Atlas’s designated agent conducts a first-level review of these records and highlights any items that may be worthy of examination, such as disciplinary actions or unsatisfactory training outcomes, for Atlas’s attention.¹⁷ Atlas and the designated agent refer to these items as “red flags.” Atlas human resources conducts a review for the red flags and alerts flight operations if an applicant’s records includes a red flag.¹⁸

Subsequent to the accident, Atlas revised its interview process to strengthen its existing procedures. It now includes a telephone screening interview where interview grading questions are asked over the telephone to gauge credibility and consistency in the applicant’s answers during the formal interview.¹⁹ Additionally, Atlas added a pilot logbook review to the interview process in order to give a better picture of the applicant’s overall career trajectory.²⁰ Atlas also added an additional level of review of each candidate’s PRIA records by a member of the flight operations team in order to provide an additional technical perspective to its candidate vetting process.²¹ Atlas also revised its pilot selection process with a standard operating procedure dedicated solely to pilot hiring.²² The process outlines Atlas’s pilot selection process, as described above, including the post-accident enhancements.

¹⁴ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 22:11–19.

¹⁵ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 23; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 23:5–12.

¹⁶ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 22:13–19.

¹⁷ *Id.*; cf. Dkt. 15, Operations Attachment 14 - Captain PRIA Documentation at 6.

¹⁸ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 22:22–25, 47:8–19.

¹⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 27.

²⁰ *Id.*

²¹ Atlas Air Worldwide, *Pilot Selection Process* 8 (2019) (attached as Exhibit 1).

²² See generally *id.*

1.2.1.1 Hiring Statistics

Atlas and its corporate affiliate Southern Air operate under a combined hiring, training, and operations program.²³ As of August 6, 2019, in 2019 Atlas had hired 203 pilots at Atlas Air and 121 at Southern Air, with average total flight times of 5,738 and 5,391 hours, respectively.²⁴ The hiring statistics in recent years were as follows: 336 pilots with an average flight time of 6,550 hours in 2018, 316 pilots with an average flight time of 6,643 hours in 2017, 323 pilots with an average flight time of 6,807 hours in 2016, 341 pilots with an average flight time of 6,498 hours in 2015, and 92 pilots with an average flight time of 7,303 hours in 2014.²⁵ In 2017, 36% of hired pilots had regional airline experience, 22% had previous widebody experience, and 15% had military backgrounds.²⁶

In the prior year, Atlas Air received approximately 1,200 to 1,400 pilot applications, a decline from an estimated 3,000 applications per year in past years.²⁷ Atlas's Director of Human Resources stated that, in response, Atlas created pathway programs through GoJet Airlines and Ameriflight (among other airlines) that provide guaranteed pilot interviews with Atlas, and it also began advertising and increasing Atlas's presence at trade events and job fairs.²⁸ Atlas employees acknowledged that filling pilot classes has become more challenging in recent years—as is common throughout the industry—and the company had made a concerted effort to maintain its hiring and training standards.²⁹

1.2.1.2 Pilot Records Improvement Act

The Pilot Records Improvement Act of 1996 (PRIA) provides that an air carrier generally cannot place a pilot into service until after it requests, receives, and reviews certain records

²³ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Scott Anderson Tr. 6:20.

²⁴ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 26.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.* at 27.

²⁸ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 27; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 17:11–19:21.

²⁹ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 16:9–22:1, 49:3–50:13 (Atlas's Director of Human Resources stating that there has been a “tough pilot market” in recent years but that “I don’t consider us being more lenient at all. But I do see the demographics are changing a little bit.”); Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 8–9, Atlas Air POI Email (“I have not heard any accusations from flight crews or from the training department that performance standards have been lowered, or that those that have satisfactorily passed their check rides did not meet FAA standards.”).

regarding the applicant pilot.³⁰ These records include materials from (1) the FAA; (2) other air carriers; and (3) the National Driver Register.³¹ The records that must be provided by the FAA include:

- Verification of the current medical certification, including date of issue, class, and any current limitations.
- Verification of the current airman certification, including date of issue, category, class, type ratings, and any limitations.
- Summaries of closed FAA enforcement actions within the previous 5-year period.
- Any past or current certificate revocations.³²

Air carriers must provide records including “records pertaining to the individual,” such as drug and alcohol test reports, and “records pertaining to the individual’s performance as a pilot,” such as proficiency and route checks, training, and releases from employment.³³ The reporting period is limited to five years, except for information which concerns a revocation or suspension that is in effect on the date of the request.³⁴ PRIA does not substantively restrict an employer’s discretion in the hiring process, but it does require that an employer obtain and review the specified records prior to placing a pilot into service.³⁵ PRIA also grants the pilot/applicant certain rights in the record retention and review process, such as the right to view and explain the records.³⁶

A carrier may contract with a designated agent to initiate and process PRIA requests and to furnish records to hiring employers and pilots/applicants, which Atlas has, as noted above.³⁷

³⁰ See Pilot Records Improvement Act of 1996, 49 U.S.C. §§ 44703(h)–(j) (1996); see also Dkt. 19, Operational Factors/Human Performance Group Factual Report, Attachment 18, U.S. Dep’t of Transp., FAA Advisory Circular No. 160-68H, *Pilot Records Improvement Act and Pilot Records Database* (2017).

³¹ See generally Dkt. 19, Operational Factors/Human Performance Group Factual Report, Attachment 18, FAA Advisory Circular No. 160-68H; see also Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 2.

³² 49 U.S.C. § 44703(h)(1)(A).

³³ *Id.* § 44703(h)(1)(B).

³⁴ *Id.* § 44703(h)(3).

³⁵ *Id.* §§ 44703(h)–(j); Dkt. 1, Operational Factors/Human Performance Group Factual Report at 24.

³⁶ 49 U.S.C. §§ 44703(h)(5)–(6), (9)–(11).

³⁷ Dkt. 19, Operational Factors/Human Performance Group Factual Report, Attachment 18, FAA Advisory Circular No. 160-68H at 16.

In 2010, after a series of accidents in which the availability of pilot records was an issue, Congress mandated the development of the Pilot Records Database,³⁸ which is currently under development and will replace the PRIA records process with an electronic clearinghouse managed by the FAA.³⁹ A decade later, the Pilot Records Database is not yet fully active, despite longstanding criticism from the aviation community that lack of progress in establishing the Pilot Records Database substantively limits air carriers' access to relevant safety information regarding prospective pilots and restricts carriers' ability to investigate applicants' records fully.⁴⁰

Once fully implemented, the Pilot Records Database is expected to provide pilot records in a standard format to requesting air carriers. Currently, air carriers receive other operators' PRIA records in a wide variety of formats, sometimes including handwritten notes or other training records that are difficult to decipher.⁴¹

1.2.2 Crew Training

Atlas Air conducts its ground school and simulator training at the Atlas Air Training Center in Miami, Florida.⁴² Atlas uses its own instructors and check airmen to conduct pilot training and evaluations based upon standards set out in the Atlas Air Flight Operations Training

³⁸ Airline Safety and Federal Aviation Administration Extension Act of 2010, Pub. L. No. 111-216 § 203, 124 Stat. 2348, 2352 (to be codified at 49 U.S.C. § 44703) (2010); Dkt. 1, Operational Factors/Human Performance Group Factual Report at 24.

³⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 24; *see also* Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 5.

⁴⁰ *See, e.g.*, FAA OIG, Audit Report AV-2015-079, *FAA Delays In Establishing a Pilot Records Database Limit Air Carriers' Access to Background Information* 3–4 (2015) ("FAA's progress in developing and implementing the PRD remains limited, and its completion remains uncertain. . . . Air carriers, in large part, do not have all relevant pilot records available to review when evaluating pilot applicants and making hiring decisions. . . . As a result, air carriers are not able to fully evaluate prior performance when deciding whether or not to hire a pilot as intended by the 2010 Act."); FAA OIG, Audit Report AV-2013-037, *FAA and Industry Are Advancing the Airline Safety Act, But Challenges Remain To Achieve Its Full Measure* (2013); *cf.* NTSB, Accident Report NTSB/AAR-10/01, PB2010-910401, *Loss of Control on Approach, Colgan Air, Inc.* 171 (2010) (making the following recommendation, among others: "Develop a process for verifying, validating, auditing, and amending pilot training records at 14 *Code of Federal Regulations* Part 121, 135, and 91K operators to guarantee the accuracy and completeness of the records").

⁴¹ FAA Advisory Circular 160-68H contains an example of a standardized Pilot Records Database Output of Records report at Appendix I. *See* Dkt. 19, Operational Factors/Human Performance Group Factual Report, Attachment 18, FAA Advisory Circular No. 160-68H at 63–70.

⁴² Dkt. 1, Operational Factors/Human Performance Group Factual Report at 18.

Manual (FOTM).⁴³ The FOTM is approved by the FAA and serves as the authority for all training program requirements, policies, and supporting information at Atlas Air.⁴⁴ For any required remedial training, Atlas follows the procedures outlined in the Atlas Air Remedial Training Protocol, which details the types of remedial training to be conducted in the event of an unsatisfactory or incomplete training event.⁴⁵

1.2.2.1 Atlas Air Stall Recovery Guidance

Atlas Air's operating procedures, which mirror industry standards, instruct pilots on recognition and recovery from both approaches to stalls and fully developed stalls.⁴⁶ Initial indications of a stall include a stick shaker, a stall warning, initial buffet, or rapid decrease of airspeed below V_2 during takeoff or V_{REF} during landing/go-around.⁴⁷ When flying with flaps extended, "stall warning is indicated by stick shaker and initial buffet."⁴⁸ Atlas Air's operations manual instruct pilots, "Do not retract flaps during the recovery."⁴⁹ It also notes that "The angle of attack is greater with speedbrakes extended."⁵⁰

Atlas Air pilots are trained to "initiate stall recovery at the first indication of a stall" using the appropriate technique.⁵¹ At altitudes below 20,000 feet, Atlas Air trains pilots to seek to recover from an approach to stall by disengaging autopilot, increasing thrust, adjusting pitch to level, retracting speedbrakes, and adjusting pitch attitude downward if stick shaker is encountered.⁵² The manual states that the pilot monitoring "should monitor and call out the vertical flight path indications (vertical speed, altimeter, radio altimeter) to assist the pilot flying in returning the aircraft to a positive rate of climb."⁵³ A fully developed stall "is characterized by any one or a combination of" buffeting, lack of pitch authority, lack of roll control, and inability to arrest descent rate.⁵⁴ A fully developed stall is usually, but not always, accompanied by a

⁴³ *Id.* Atlas is recognized for its training programs. For example, Atlas has provided training to the pilots of Air Force One for more than ten years.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ Dkt. 28, Operational Factors/Human Performance Group Factual Report, Attachment 27, Atlas Air Stall Recovery Guidance at 2.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ *Id.* at 3.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.* at 4.

⁵³ *Id.*

⁵⁴ *Id.* at 5.

continuous stall warning.⁵⁵ Atlas Air trains its pilots to recover from a fully developed stall by disengaging autopilot; “[a]pplication of as much as full forward control column and use of some nose-down stabilizer trim should provide sufficient elevator control to produce a nose-down pitch rate.”⁵⁶

1.2.2.2 Atlas Air Upset Recovery Guidance

Atlas Air guidance states that an upset is “an inadvertent aircraft attitude occurring as a result of such things as turbulence, instrument failure, distraction, spatial disorientation, or transition from VMC to IMC.”⁵⁷ An upset is defined as unintentionally exceeding any of the following conditions: pitch attitude greater than 25 degrees nose up; pitch attitude greater than 10 degrees nose down; bank angle greater than 45 degrees; or an airspeed “inappropriate for conditions.”⁵⁸ If an aircraft is in an approach to stall or fully developed stall, “it is necessary to recover from a stall before applying any other [upset] recovery actions.”⁵⁹ Pilots should recognize an upset “by an unexpected presentation on the attitude display and/or conflicting indications on the performance instruments.”⁶⁰

Atlas Air trains pilots to “transition to instrument references any time disorientation occurs or outside visual references become unreliable.”⁶¹ The manual further warns pilots that “[a]irspeed decreases rapidly if the pitch attitude is more than 25° and increasing” and instructs pilots to “trade altitude for airspeed and maneuver the aircraft’s flight path back toward the horizon.”⁶² “This is accomplished using up to full nose-down elevator.”⁶³ The Atlas Flight Crew Operations Manual for the Boeing 767 is based on materials provided by Boeing, and Atlas generally does not modify the Boeing guidance that it incorporates into its own materials.

1.2.2.3 Atlas Air Turbulence Guidance

Atlas Air’s operations manual states that “the autopilot and/or autothrottle may remain engaged unless performance is not desirable” in light to moderate turbulence.⁶⁴ The manual

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ Dkt. 29, Operational Factors/Human Performance Group Factual Report, Attachment 28, Atlas Air Upset Recovery Guidance at 2.

⁵⁸ *Id.*

⁵⁹ *Id.* at 6.

⁶⁰ *Id.* at 2.

⁶¹ *Id.*

⁶² *Id.* at 4.

⁶³ *Id.*

⁶⁴ Dkt. 30, Operational Factors/Human Performance Group Factual Report, Attachment 29, Atlas Air Turbulence Guidance at 2.

further states that the minimum speed to provide an adequate buffet margin below 10,000 feet is 240 to 250 knots.⁶⁵ Pilots are instructed to disconnect the autothrottle in severe turbulence.⁶⁶

In the event that severe turbulence is encountered below 15,000 feet and gross weight is less than the maximum landing weight, pilots may reduce airspeed to 250 knots in the clean configuration (*i.e.*, flaps and speedbrakes retracted).⁶⁷

1.2.2.4 Automation and Go-Around Switch

The Atlas Air Automation Policy is defined in the Atlas-Southern Flight Operations Manual (FOM).⁶⁸ According to the policy, automation is provided to enhance safety, maximize efficiency, reduce crewmember workload, and improve operational capabilities.⁶⁹ Atlas Air directs pilots to use the available automation tools at the level most appropriate to achieve those objectives.⁷⁰ The Atlas FOM includes the following “Automation Rules of Thumb”:

- “Immediate maneuvering is required: reduce the level of automation.
- Automation is the problem: reduce the level of automation.
- Workload increases (an automation is not the problem): increase the level of automation.”⁷¹

The FOM directs the pilot flying to “clearly communicate the level of intended automation” and the pilot monitoring to “alert [the pilot flying] of a hindrance the proposed level of automation may have on flight path monitoring and/or crew workload.”⁷²

Atlas instructs pilots to use the go-around switch to perform a go-around when necessary in either VMC or IMC operations.⁷³ Atlas does not train its pilots to use the go-around switch (or go-around mode) in cruise, in response to turbulence, or to recover from an upset or a stall.⁷⁴

⁶⁵ *Id.*

⁶⁶ *Id.* at 4. The data indicates that flight 3591 did not experience severe turbulence.

⁶⁷ *Id.*

⁶⁸ As previously noted, Atlas and Southern Air operate under a combined training and operations program.

⁶⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 74.

⁷⁰ *Id.*

⁷¹ *Id.* at 74–75.

⁷² *Id.* at 75.

⁷³ *Id.* at 80, 82.

⁷⁴ See generally Dkt. 28, Operational Factors/Human Performance Group Factual Report, Attachment 27, Atlas Air Stall Recovery Guidance; Dkt. 29, Operational Factors/Human Performance Group Factual Report, Attachment 28, Atlas Air Upset Recovery Guidance; Dkt. 30, Operational Factors/Human Performance Group Factual Report, Attachment 29, Atlas Air Turbulence Guidance.

Atlas has a “no-fault” go-around policy regarding go-arounds in approach to landing.⁷⁵ Neither Atlas nor Boeing has a specific procedure for the inadvertent selection of a go-around switch.⁷⁶

1.2.2.5 Captain and First Officer Interaction

Atlas’s FOM designates the captain of an aircraft as the final decision-making authority, although it is the responsibility of all crewmembers to contribute to the decision-making process to ensure that the best decisions are made.⁷⁷ Accordingly, a first officer’s duty includes bringing any information that has an impact on operational safety to the attention of the captain and to speak up with appropriate persistence if the first officer has any doubts about the safety of the flight.⁷⁸ Atlas’s FOM states, consistent with the company’s overall policy, that safety and compliance with Atlas Air procedures and FAA regulatory standards are the highest priority for Atlas Air and its personnel.⁷⁹

With respect to command authority, Atlas’s FOM details that a captain has full responsibility and is the final authority for the safe operation of the aircraft.⁸⁰ In emergency situations, Atlas’s FOM provides the following guidance:

The crewmember that first recognized the emergency should announce it in a firm, clear voice. If the fire bell is ringing, it should be silenced promptly without command. When the pilot flying is informed of, or detects, an impending emergency or abnormal condition, he will:

- Fly the aircraft
- Evaluate the situation
- Call for the appropriate checklist
- Complete the prescribed procedure

One pilot must fly the airplane. The Captain may elect to fly the airplane himself or to have the other pilot fly it. Assuming control of the airplane does not relieve the Captain of the responsibility for directing crew action. Ensure positive transfer of airplane control from one pilot to the other. During the execution of abnormal/non-normal and emergency procedures a crosscheck and verbal confirmation by two flight crew members (dual response) occurs before the actuation of any critical aircraft system controls. These

⁷⁵ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 81.

⁷⁶ *Id.*

⁷⁷ *Id.* at 28.

⁷⁸ *Id.* at 29.

⁷⁹ *Id.* at 28.

⁸⁰ *Id.* at 30.

controls address as a minimum engine thrust levers, fuel master or control switches, engine fire switches, and IDG disconnect switches.⁸¹

Atlas's FOM further provides:

If a deviation [from standard procedures] occurs, the [pilot monitoring] should query, alert, or warn the [pilot flying]. After two communications with no response from the [pilot flying], the other crewmember(s) should suspect incapacitation and consider taking action. In critical situations, action may be taken prior to a second communication.⁸²

According to Atlas's FOM, crewmembers must continuously monitor the flight path and energy of the aircraft to ensure the projected path is correct and safe.⁸³

1.2.3 Proficiency Watch Program

The Atlas Air Proficiency Watch Program (PWP) is a program Atlas established for crewmember remedial training and tracking.⁸⁴ The PWP is Atlas's process for monitoring and improving the performance of the following flight crewmembers:⁸⁵

- A flight crewmember who fails to complete a training or qualification event satisfactorily.⁸⁶
- A flight crewmember whose performance has been determined by an Event Review Board to not have met Company standards and is re-entered into training or qualification events.
- Flight crewmembers who have demonstrated a repetitive need for additional training.

In April 2016, Atlas amended its PWP to remove a single-failure triggering event and provide the Fleet Captain with greater discretion on placing a pilot in PWP.⁸⁷ This was done to

⁸¹ *Id.*

⁸² *Id.* at 31.

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ This element was in effect during the Captain's training, although not at the time of the First Officer's training, as discussed below.

⁸⁷ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 21, Operational Factors/Human Performance Group Factual Report, Attachment 20, Atlas Air PWP Program (FOTM Revision).

permit the Fleet Captain to assess a pilot's proficiency more completely.⁸⁸ Atlas personnel reported that this change permitted the company to focus the PWP on proficiency challenges that were more common and in need of addressing, thus making the overall PWP more effective.⁸⁹ Once entered into the PWP, a pilot is generally monitored for six months; if a pilot successfully progresses during this period, Atlas releases the pilot from the PWP.⁹⁰ If the pilot does not successfully progress, the pilot reenters the PWP.⁹¹

1.3 Personnel Information

1.3.1 The Captain

The Captain's relevant employment history is as follows:⁹²

Employer	Start Date	End Date	Experience
FlightSafety International	March 2002	September 2003	Flight Instructor
CommutAir (Continental Connection)	September 2003	July 2005	Beechcraft B-1900D Airliner First Officer
ExpressJet (United Express)	July 2005	September 2015	EMB-145 Captain
Atlas Air	September 2015		B767 First Officer; B767 Captain

At the time of the accident, the Captain's flight times were as follows:⁹³

Description	Hours
Total Pilot Flying Time	11,172
Total Pilot-In-Command (PIC) Time	4,235
Total B-767 Series Flying Time	1,252
Total B-767 PIC Flying Time	157
Total Flying Time Last 24 Hours	2:25
Total Flying Time Last 30 Days	34
Total Flying Time Last 90 Days	100
Total Flying Time Last 12 Months	365

⁸⁸ See generally Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 21, Operational Factors/Human Performance Group Factual Report, Attachment 20, Atlas Air PWP Program (FOTM Revision).

⁸⁹ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 2, Atlas Air Interview Transcripts, Joseph Diedrich Tr. 13:12–14:1.

⁹⁰ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 21.

⁹¹ Dkt. 21, Operational Factors/Human Performance Group Factual Report, Attachment 20, Atlas Air PWP Program (FOTM Revision) at 6.

⁹² Dkt. 1, Operational Factors/Human Performance Group Factual Report at 11.

⁹³ *Id.* at 13.

1.3.1.1 Hiring and PRIA

The Captain was hired by Atlas on September 7, 2015.⁹⁴ On September 22, 2015, Atlas's PRIA designated agent completed a check of the National Driver Register, FAA records, and the three past employers disclosed by the captain—ExpressJet, CommutAir, and FlightSafety International.⁹⁵

1.3.1.2 Atlas Training History

While at Atlas, the Captain completed the following relevant training events and proficiency checks, among others:⁹⁶

Event	Date
Atlas Air Date of Hire	September 7, 2015
Date Upgraded to Captain on B-767	August 25, 2018
Date of Most Recent Proficiency Training	August 12, 2018
Date of Most Recent Proficiency Check (B-767)	August 25, 2018
Date of Most Recent PIC Line Check (B-767)	October 11, 2018

The Captain completed all Atlas training satisfactorily, with only one exception. On October 31, 2015, the Captain was not recommended for his B-767 type rating ride due to over-speeding the flaps during stall recovery, consistently failing to set missed approach altitude, and missed approach procedures.⁹⁷ The Captain completed remedial training—which included speed awareness during recovery from approaches to a stall—satisfactorily on November 1, 2015.⁹⁸ The following day, the Captain satisfactorily completed his B-767 type rating check ride, which included an evaluation of a takeoff stall during a turn.⁹⁹

⁹⁴ *Id.* at 13.

⁹⁵ *Id.* at 25; Dkt. 15, Operational Factors/Human Performance Group Factual Report, Attachment 14, Captain PRIA Documentation.

⁹⁶ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 13.

⁹⁷ *Id.* at 19; *see also* Dkt. 12, Operational Factors/Human Performance Group Factual Report, Attachment 11, Atlas Training Records - Captain.

⁹⁸ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 19; *see also* Dkt. 12, Operational Factors/Human Performance Group Factual Report, Attachment 11, Atlas Training Records - Captain.

⁹⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 19; *see also* Dkt. 12, Operational Factors/Human Performance Group Factual Report, Attachment 11, Atlas Training Records - Captain.

As part of the Captain’s upgrade ground training, the Captain received a two-hour module on crew resource management (CRM)—as outlined in the Atlas CRM Training Presentation¹⁰⁰—and an eight-hour module on captain leadership.¹⁰¹

1.3.1.3 Proficiency Watch Program

The Captain was placed in the Atlas PWP following his October 29, 2015, failure to be recommended for his B-767 type rating ride.¹⁰² On February 22, 2017, the Captain exited PWP after successfully completing its requirements.¹⁰³

1.3.2 The First Officer

The First Officer’s employment history is presented in the following chart.¹⁰⁴ Importantly, as discussed below, certain of this information was unknown to Atlas prior to this accident investigation.

Employer	Start Date	End Date	Experience
Air Turks and Caicos (InterCaribbean Airways)	June 2008	June 2010	EMB-120 First Officer
CommutAir	May 2011	June 2011	Did not complete training
Air Wisconsin	April 2012	August 2012	Did not complete training
Charter Air Transport	February 2013	March 2014	EMB-120 First Officer
Trans State Airlines	March 2014	September 2014	EMB-145 First Officer
Mesa Airlines	February 2015	July 2017	EMB-175 First Officer
Atlas Air	July 2017		B767 First Officer

According to the records of Mesa Airlines, the First Officer attempted to upgrade to captain on the EMB-175 in May 2017 and was graded unsatisfactory after two simulator sessions and returned to the line as an EMB-175 first officer before later leaving Mesa for “career growth.”¹⁰⁵ In his short period at Air Wisconsin in 2012, the First Officer did not complete CRJ

¹⁰⁰ See Dkt. 23, Operational Factors/Human Performance Group Factual Report, Attachment 22, Atlas CRM Training Presentation.

¹⁰¹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 19.

¹⁰² See Dkt. 12, Operational Factors/Human Performance Group Factual Report, Attachment 11, Atlas Training Records - Captain at 115.

¹⁰³ See *id.* at 114.

¹⁰⁴ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 13–14.

¹⁰⁵ *Id.* at 13; see also Dkt. 3, Operational Factors/Human Performance Group Factual Report, Attachment 2, Records of Conversation at 2–12.

training but resigned in August 2012, citing personal reasons.¹⁰⁶ While at CommutAir in 2011, the First Officer did not complete DHC-8 training but resigned in June 2011 due to “lack of progress in training.”¹⁰⁷

Prior to the accident, the First Officer’s flight times were as follows:¹⁰⁸

Description	Hours
Total Pilot Flying Time	5,073
Total PIC Time	1,237
Total SIC Time	1,757
Total B-767 SIC Flying Time	520
Total Flying Time Last 24 Hours	2:25
Total Flying Time Last 30 Days	34
Total Flying Time Last 90 Days	106
Total Flying Time Last 12 Months	375

1.3.2.1 Hiring and PRIA

The First Officer was hired by Atlas on July 3, 2017 (subject to and contingent upon completion of a satisfactory background check).¹⁰⁹ On August 11, 2017, Atlas’s PRIA designated agent completed a check of the National Driver Register, FAA records, and four past employers that were disclosed to Atlas by the First Officer—Mesa Airlines, Trans States Airlines, Charter Air Transport, and Air Turks and Caicos.¹¹⁰

During his hiring process, the First Officer did not disclose to Atlas his employment with Air Wisconsin in 2012 nor his employment with CommutAir in 2011.¹¹¹ The First Officer also neglected to disclose his resignations from these past employers and his failure to complete the training programs at these past employers.¹¹² Accordingly, Air Wisconsin and CommutAir were not part of the PRIA requested information for the First Officer.¹¹³ (The First Officer’s employment at Air Wisconsin and CommutAir also fell outside of PRIA’s five-year window.) To explain his gaps in employment, the First Officer stated on his application that “[t]here were

¹⁰⁶ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 13.

¹⁰⁷ *Id.* at 14.

¹⁰⁸ *Id.* at 16.

¹⁰⁹ *Id.*

¹¹⁰ *Id.* at 25; Dkt. 16, Operational Factors/Human Performance Group Factual Report, Attachment 15, First Officer PRIA Documentation. The First Officer’s employment at Air Turks and Caicos fell outside of PRIA’s five-year window.

¹¹¹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 25.

¹¹² *Id.*

¹¹³ *Id.*

time when I was furloaded [sic] and also went to college to attained [sic] degrees.”¹¹⁴ During interviews with the FAA, the FAA stated with respect to any potential verification of PRIA records as accurate and complete that “PRIA depend[s] on the accuracy and honesty of the pilot who is making the application to a new carrier.”¹¹⁵

Atlas Air was not aware of the First Officer’s employment at either Air Wisconsin or CommutAir, or that he was unsuccessful in both training programs.¹¹⁶ Atlas’s Director of Training stated that such information would have been relevant for evaluation of the First Officer and further stated that “we would not have offered [the First Officer] a position” if Atlas had known at the time that the First Officer failed to disclose the relevant information in his employment application.¹¹⁷

On his Atlas employment application, when asked “have you ever failed an initial, upgrade, transition, or recurrent proficiency check,” the First Officer answered “yes,” but he only disclosed the following: “when I was doing my ATP check ride, I had to redo one non precision approach I have all documents to support this.”¹¹⁸

Mesa Airlines’ training records indicate that the First Officer was unsuccessful on his attempt to upgrade on the EMB-175 in May 2017 after being graded unsatisfactory after two simulator sessions.¹¹⁹ The PRIA records provided to Atlas during the First Officer’s hiring process, however, did not contain sufficient detail to permit Atlas to learn of these training failures. Specifically, the records provided to Atlas in the PRIA process stated only that “Per

¹¹⁴ *Id.*

¹¹⁵ Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 3, John Ryan (FAA) interview; *see also* Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 35:17–19 (Atlas’s Director of Human Resources stating, “It’s always a problem if a candidate does not reveal things to you. You can’t query carriers that you were unaware that they worked for.”).

¹¹⁶ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 25; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Scott Anderson Tr. 32:10–21.

¹¹⁷ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 25; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Scott Anderson Tr. 33:9–12; *see also id.*, Denise Borrelli Tr. 59:23–25 (Atlas’s Director of Human Resources stating, “if we find a discrepancy on an application which someone didn’t reveal an employer, we either don’t hire them or they are terminated unless there’s some [adequate explanation].”).

¹¹⁸ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 25.

¹¹⁹ *Id.*; Dkt. 15, Operational Factors/Human Performance Group Factual Report, Attachment 15, First Officer PRIA Documentation.

email received on 09May17. He is returning to FO.”¹²⁰ As a result, Atlas’s PRIA review designated agent did not “red flag” the First Officer’s Mesa Airlines records during its review.¹²¹ Atlas hiring personnel also did not note the significance of the ambiguous item in the PRIA records.¹²² Reflecting after the accident, Atlas personnel noted that the information provided in the Mesa PRIA records “was vague.”¹²³ (The Operational Factors/Human Performance factual report incorrectly states that Atlas’s Director of Training said the vague report “should have been identified for additional follow-up.”¹²⁴ Rather, when asked if there were “[a]nything preventing Atlas from calling up Mesa Airlines and getting additional information on that?” the Director of training indicated that he was not sure whether that was legally permitted under PRIA.¹²⁵) During interviews with the FAA, “[w]hen asked how a voluntary withdrawal from a training program [would be] handled as a requirement for disclosure in PRIA, [FAA personnel] said nothing in PRIA addressed that.”¹²⁶

Following the accident Atlas has instituted, as part of its PRIA process, a flight operations review of the PRIA record of all new hire pilots.¹²⁷ In addition to the review by human resources for any red flags, the flight operations review ensures that each PRIA record is analyzed from a technical perspective. Post-accident, Atlas has also clarified and formalized its PRIA workflow in its FOTM.¹²⁸

The First Officer’s PRIA records from Trans States reflected that the First Officer was graded unsatisfactory on his EMB-145 type rating oral examination on April 22, 2014, was graded unsatisfactory on his EMB-145 ATP check ride on May 11, 2014, and was graded unsatisfactory on his EMB-145 line checks on August 15, 2014 and September 8, 2014.¹²⁹ Atlas

¹²⁰ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 25; Dkt. 16, Operational Factors/Human Performance Group Factual Report, Attachment 15, First Officer PRIA Documentation at 31.

¹²¹ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. at 51:1–17; *id.* Scott Anderson Tr. 28:15.

¹²² *Id.* Scott Anderson Tr. 36:1–11.

¹²³ *Id.* at 30:22.

¹²⁴ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 26.

¹²⁵ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Scott Anderson Tr. 30:24–31:2.

¹²⁶ Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 3, John Ryan (FAA) interview.

¹²⁷ See Atlas Air Worldwide, *Pilot Selection Process* 8 (2019) (attached as Exhibit 1).

¹²⁸ See Atlas-Polar-Southern FOTM, Bulletin 77, at 6 (2019) (attached as Exhibit 2).

¹²⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 26.

Air's Director of Human Resources stated that the First Officer had disclosed his Trans States training issues during his Atlas interview and explained them satisfactorily.¹³⁰

1.3.2.2 Atlas Training History

While at Atlas, the First Officer completed the following relevant training events and proficiency checks, among others:¹³¹

Event	Date
Atlas Air Date of Hire	July 3, 2017
Date Transitioned to B-767	September 26, 2017
Date of Initial Type Rating on B-767	September 26, 2017
Date of Most Recent Proficiency Training	July 7, 2018
Date of Most Recent Proficiency Check (B-767)	July 8, 2018
Date of Most Recent SIC Line Check (B-767)	November 22, 2017

The First Officer completed Atlas training satisfactorily, with the following notable events occurring during training:¹³²

- On July 27, 2017, the First Officer was not recommended for his B-767 type rating oral examination. Following 4.5 hours of remedial training, the First Officer was recommended for and successfully passed the oral examination on July 29, 2017.
- Following the First Officer's fifth fixed base simulator (FBS) training session, the First Officer was not recommended to proceed to the full flight simulator (FFS) training due to difficulty completing normal procedures. Following four hours of remedial training in the FBS, the First Officer successfully completed FBS training on August 8, 2017.
- Following his initial two FFS training sessions, the First Officer's simulator partner complained he was being held back; as a result, Atlas restarted the First Officer's FFS training on August 27, 2017.
- After the First Officer completed his sixth FFS training session, Hurricane Irma caused a shutdown at Atlas's training headquarters in Miami, Florida. Sixteen days later, on September 19, 2017, the First Officer resumed his FFS training. On September 22, 2017,

¹³⁰ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 25:11–26:11 (“I matched up the Trans States Failure with my notes. The actual notes in the record are my notes, that’s in my handwriting. . . . I interviewed him. He did thoroughly disclose his troubles at Trans States during his interview.”).

¹³¹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 16.

¹³² See Dkt. 1, Operational Factors/Human Performance Group Factual Report at 19–21; Dkt. 13, Operational Factors/Human Performance Group Factual Report, Attachment 12, Atlas Training Records - First Officer.

the First Officer failed his practical B-767 type rating examination due to unsatisfactory performance in crew resource management, threat and error management, non-precision approaches, steep turns, and judgment. After 4 hours of remedial FFS training, the First Officer successfully passed his B-767 type rating check ride on September 26, 2017.

Although the First Officer experienced unsatisfactory events during his training, these events did not involve stall awareness.¹³³

1.3.2.3 Proficiency Watch Program

Atlas did not place the First Officer into the PWP after his unsuccessful B-767 type rating check ride on September 22, 2017.¹³⁴ Under the guidelines, the Fleet Captain retained discretion whether to enroll the First Officer in PWP.

Atlas's B-747/767 Fleet Captain stated that when evaluating whether to place the First Officer into the PWP, he took into consideration the First Officer's potential nervousness during the check ride (because an FAA inspector was observing the First Officer's check ride), as well as the multiple pauses in the First Officer's training and family issues the First Officer was experiencing.¹³⁵ Ultimately, the Fleet Captain decided to monitor the First Officer's operational experience before deciding whether to place the First Officer into the PWP, which was consistent with past practice.¹³⁶ The First Officer experienced no further difficulties with his subsequent recurrent training and therefore was not placed into the PWP.¹³⁷

¹³³ See Dkt. 13, Operational Factors/Human Performance Group Factual Report, Attachment 12, Atlas Training Records - First Officer.

¹³⁴ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Joseph Diedrich Tr. 12:20–13:11 (Atlas's Boeing 747/767 Fleet Captain stating that "back when [the Captain] was put in the PWP program, it was different than the PWP program later on. . . . [I]f you repeated any training of an initial program, anything at all, you were a candidate for the PWP. And that's pretty punitive. . . . We subsequently, in 2016, amended the PWP program."); Dkt. 21, Operational Factors/Human Performance Group Factual Report, Attachment 20, Atlas Air PWP Program (FOTM Revision).

¹³⁵ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Joseph Diedrich Tr. 18:20–19:5.

¹³⁶ See Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Mark Hoover Tr. 16:18–20 (Atlas B767 Check Airman stating: "They [the trainees] wouldn't be put on the PWP until they went through Operating Experience, typically.").

¹³⁷ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 22; Dkt. 13, Operational Factors/Human Performance Group Factual Report, Attachment 12, Atlas Training Records - First Officer; Dkt. 2, Operational Factors/Human Performance Group Factual Report,

After the accident, Atlas has revised its PWP structure in order to focus the program and make it more prescriptive, including adding additional guidance on entry into the PWP and the records to be prepared for evaluation of pilots who are enrolled into the PWP.¹³⁸

1.4 The Accident Sequence

Atlas Air flight 3591 departed from MIA at approximately 11:33 a.m. Eastern Standard Time (10:33 a.m. CST) on February 23, 2019.¹³⁹ The takeoff and cruise portions of the flight to 40,000 feet were uneventful.¹⁴⁰

No significant events relevant to the accident sequence occurred between takeoff from MIA at 11:33 a.m. EST and initial descent. The aircraft began descent at approximately 12:25 p.m. CST.¹⁴¹ The First Officer was the pilot flying and the Captain was the pilot monitoring during the descent, except as noted below.¹⁴²

Around 12:34 p.m. CST, air traffic control advised flight 3591 that there was “light to heavy precipitation” between the flight’s location and IAH and advised that the flight could be vectored around the weather.¹⁴³ At 12:35 p.m. CST, flight 3591 checked in with the I90 final controller.¹⁴⁴ Air traffic control informed flight 3591 to expect vectors to runway 26L and asked the pilot if he preferred to go east or west to get around the weather.¹⁴⁵ The First Officer responded that he would go on the west side.¹⁴⁶ Air traffic control informed the pilot that the “only problem” with going west was that there was “a lot of departures” so flight 3591 would need to expedite its descent.¹⁴⁷

Flight 3591 did not acknowledge air traffic control’s instruction to descend to 3,000 feet.¹⁴⁸ Air traffic control repeated its instruction to conduct an expedited descent and maintain

Attachment 1, Atlas Air Interview Transcripts, Joseph Diedrich Tr. 18:9 (“[The First Officer] had no issues on OE.”).

¹³⁸ See Atlas-Polar-Southern FOTM, Bulletin 77, at 4–5 (2019) (attached as Exhibit 2).

¹³⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 7–8.

¹⁴⁰ *Id.* at 8–9.

¹⁴¹ *Id.* at 9.

¹⁴² *Id.* at 9–10; Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 49–50.

¹⁴³ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 9.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*; Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 45.

¹⁴⁷ Dkt. 52, Air Traffic Control Group Factual Report at 7.

¹⁴⁸ Dkt. 60, Air Traffic Control Group Factual Report, Attachment 8, ATC Transcript at 3–4.

3,000 feet in a second transmission approximately eight seconds later.¹⁴⁹ The Captain acknowledged the second instruction to maintain a west heading and descend to 3,000 feet.¹⁵⁰ The speedbrakes were extended at 12:37:01 p.m. CST.¹⁵¹

At 12:36:07 p.m. CST, the First Officer made a comment indicating that he was experiencing a malfunction with his instrument display.¹⁵² Six seconds later, he said “LNAV VNAV center autopilot,” consistent with the briefing for a transfer of controls.¹⁵³ The Captain assumed the controls at 12:36:19 p.m. CST.¹⁵⁴ At 12:37:00 p.m. CST, the First Officer asked the Captain to “hold off on that checklist.”¹⁵⁵

The First Officer appears to have resolved the EADI failure mode at 12:37:07 p.m. CST. He said “E-fy” (likely referring to the EFI source selector switch), and an unknown crewmember replied “E-fy.”¹⁵⁶ The EFI source selector permits the crew to select the data source for flight information displayed on the electronic flight instrument system (EFIS).¹⁵⁷ One second later, the First Officer said “okay I got it back.”¹⁵⁸ The Captain responded “now it’s back” and laughed.¹⁵⁹ Less than a second later, the CVR recorded the sound of two quick beeps of unknown frequency.¹⁶⁰ At 12:37:11 p.m. CST, the First Officer said, “I press the E-fy button- it fixes everything” and the Captain agreed.¹⁶¹ The First Officer resumed control of the airplane at 12:37:24 p.m. CST.¹⁶²

Weather radar imagery from Houston depicted a “fine line” system running southwest to northeast across Trinity Bay at the time of the crash.¹⁶³ A fine line is “[a] narrow, elongated,

¹⁴⁹ *Id.*

¹⁵⁰ Dkt. 52, Air Traffic Control Group Factual Report at 7.

¹⁵¹ Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 11.

¹⁵² Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 44–45; Dkt. 1, Operational Factors/Human Performance Group Factual Report at 10.

¹⁵³ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 45.

¹⁵⁴ *Id.*

¹⁵⁵ *Id.* at 47.

¹⁵⁶ *Id.* at 48.

¹⁵⁷ Dkt. 69, Systems Group Chairman’s Factual Report at 45.

¹⁵⁸ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 47.

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.* at 49.

¹⁶³ Dkt. 38, Meteorology Factual Report at 9–10.

non-precipitating echo. It is usually associated with thunderstorm outflows, fronts, or other density discontinuities.”¹⁶⁴

At approximately 12:38 p.m. CST, the autopilot vertical mode was changed from VNAV to Flight Level Change and the mode control panel altitude selection was changed to 3,000 feet.¹⁶⁵ At 12:38:04, the flaps were selected from up to position one.¹⁶⁶ The FDR data indicate that flight 3591 experienced light turbulence beginning at approximately 12:38:25 p.m. CST.¹⁶⁷ That turbulence was likely associated with a transition to instrument meteorological conditions.¹⁶⁸ Flight 3591 intersected the fine line weather system as depicted on weather radar at approximately 12:38:31 p.m. CST.¹⁶⁹

Also at 12:38:31 p.m. CST, the go-around mode was activated by one of the go-around switches on the throttle quadrant while the plane was at approximately 6,300 feet pressure altitude.¹⁷⁰ There is no mention of activating a go-around by either the First Officer or Captain on the voice recorder.¹⁷¹ Immediately after activation of go-around mode, the left and right thrust levers moved forward from approximately 30 degrees to approximately 81.6 degrees over the course of six seconds.¹⁷² Between 12:38:31 and 12:38:43 p.m. CST, both engines increased thrust from approximately 30% of maximum RPM to approximately 110% of maximum RPM.¹⁷³

At 12:38:35 p.m. CST, air traffic control directed flight 3591 to continue on its current course for eighteen miles before turning north to reach IAH.¹⁷⁴ The FDR recorded the speedbrakes being retracted to near zero position, and the Captain responded, “sounds good.”¹⁷⁵

¹⁶⁴ *Id.* at 9, n.6.

¹⁶⁵ Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 5.

¹⁶⁶ *Id.*

¹⁶⁷ Dkt. 61, Airplane Performance Study at 3, 10.

¹⁶⁸ *Id.* at 3.

¹⁶⁹ Dkt. 38, Meteorology Factual Report at 14.

¹⁷⁰ Dkt. 61, Airplane Performance Study at 2.

¹⁷¹ See Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 49–50 (showing no discussion of go-around mode either before or after a mechanical click occurring at 12:38:31.1 p.m. CST); see also Dkt. 68, Cockpit Voice Recorder Sound Spectrum Study at 5–9 (finding that the click “shares some characteristics” of the sound of a go-around switch activation without conclusively finding that to be the source).

¹⁷² Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 14.

¹⁷³ *Id.*

¹⁷⁴ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 49.

¹⁷⁵ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 10; Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50.

ATC then told the crew that it was clear on the other side of the weather and that they should have no problem reaching the airport.¹⁷⁶

After activation of go-around mode, the airplane pitch attitude increased from approximately 1 degree nose-down to approximately 4 degrees nose-up at 12:38:37 p.m. CST.¹⁷⁷ No later than 12:38:38 p.m. CST, the First Officer commanded aircraft nose down.¹⁷⁸

At 12:38:40 p.m. CST, the “[s]ound of four beeps within a duration of .75 seconds at a frequency of 1200 Hz” is heard.¹⁷⁹ These sounds are consistent with the “owl” beeper aural warning used for all system alert caution messages, and is consistent with an autopilot override due to the First Officer’s control inputs with the autopilot still engaged.¹⁸⁰

At 12:38:43 p.m. CST, the cockpit area microphone recorded the First Officer saying something that may have been “oh.”¹⁸¹ At 12:38:45 p.m. CST, the First Officer said “whoa,” followed immediately by “where’s my speed my speed,” and both statements were spoken in an elevated voice.¹⁸² Between 12:38:40 and 12:38:45 p.m. CST, the airspeed increased from approximately 230 knots to 260 knots.¹⁸³

Between 12:38:35 and 12:38:47 p.m. CST, the Captain was sending and receiving a series of radio communications with air traffic control directing flight 3591 to transit the weather to the west before turning north to approach IAH.¹⁸⁴ Also during this period, the aircraft’s pitch was approximately 5 degrees nose up at the time of air traffic control’s 12:38:35 p.m. CST transmission directing flight 3591 to head west 18 miles,¹⁸⁵ approximately 3 degrees nose down at the time of air traffic control’s 12:38:43 p.m. CST transmission stating that the weather was

¹⁷⁶ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 10; Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50.

¹⁷⁷ Dkt. 61, Airplane Performance Study at 3.

¹⁷⁸ Dkt. 61, Airplane Performance Study at 11.

¹⁷⁹ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50.

¹⁸⁰ Dkt. 68, Cockpit Voice Recorder Sound Spectrum Study at 10–11.

¹⁸¹ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50.

¹⁸² *Id.* The factual report notes that the word “where’s” is a questionable insertion. *See id.* at 10, 50.

¹⁸³ Dkt. 61, Airplane Performance Study at 10.

¹⁸⁴ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 49–50.

¹⁸⁵ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 49; Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 14.

“severe clear” on the west side of the cloud formation,¹⁸⁶ and approximately 17 degrees nose down at the time of the Captain’s final transmission at 12:38:47 p.m. stating “Okay.”¹⁸⁷

At approximately 12:38:45 p.m. CST, the left and right thrust levers were brought back from approximately 81.6 degrees to 33 degrees.¹⁸⁸ Both thrust levers were then returned to 83 degrees at approximately 12:38:49 p.m. CST.¹⁸⁹ The engines decreased power from 110% power at 1:38:46 p.m. CST to a minimum of 82% power at 1:38:49 p.m. CST before returning to approximately 105% of power at 1:38:52 p.m. CST.¹⁹⁰ The rapid movement of the thrust levers is consistent with manual input.

At 12:38:47 p.m. CST, when the aircraft was at approximately 17 degrees aircraft nose down, the Captain began pulling back on the elevator, as indicated by a split in the left and right elevators.¹⁹¹ The Captain did not verbalize a change of control or make any other comment.¹⁹² At 12:38:48 and 12:38:50 p.m. CST, the First Officer said, “we’re stalling” and “stall.”¹⁹³ The information retrieved from the FDR provides no indication of aerodynamic stall, and the CVR did not include sounds indicative of a stall indication, such as the stick shaker.¹⁹⁴

At 12:38:55 p.m. CST, the aircraft was at approximately 3,500 feet MSL.¹⁹⁵ The cloud ceiling was estimated to be 3,500 feet MSL at the accident location.¹⁹⁶

The First Officer called the Captain’s name at 12:38:55 p.m. CST.¹⁹⁷ The Captain responded and asked what was going on at 12:38:55 p.m. CST.¹⁹⁸ At approximately the same time, the First Officer commanded maximum nose-up.¹⁹⁹ Both the First Officer and Captain

¹⁸⁶ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50; Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 14.

¹⁸⁷ Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50; Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 14.

¹⁸⁸ Dkt. 66, Flight Data Recorder Specialist’s Report, Attachment 1.

¹⁸⁹ Dkt. 65, Flight Data Recorder Specialist’s Factual Report at 14.

¹⁹⁰ *Id.*

¹⁹¹ Dkt. 61, Airplane Performance Study at 11.

¹⁹² Dkt. 67, Cockpit Voice Recorder Group Chairman’s Factual Report at 50–51.

¹⁹³ *Id.* at 51.

¹⁹⁴ *Id.*

¹⁹⁵ Dkt. 65, Flight Data Recorder Specialists Factual Report at 14.

¹⁹⁶ *See* Dkt. 38, Meteorology Factual Report at 5–7.

¹⁹⁷ Dkt. 67, Cockpit Voice Recorder - Group Chairman’s Factual Report at 51.

¹⁹⁸ *Id.* at 51.

¹⁹⁹ Dkt. 61, Airplane Performance Study at 3, 11.

maintained nose-up commands from that time until the aircraft impacted terrain.²⁰⁰ The airplane pitch reached a maximum of 49 degrees nose-down by approximately 12:38:57 p.m. CST before recovering to approximately 16 degrees nose-down by the time it impacted the water at 12:39:03 p.m. CST.²⁰¹

The last recorded airspeed was 433.5 knots.²⁰² The autopilot and autothrottle systems were still engaged at impact.²⁰³

The airplane impacted the ground in a shallow, muddy swamp area near Anahuac, Texas, close to where the Trinity River enters Trinity Bay.²⁰⁴ The main debris field was oriented east to west, extended west approximately 350 yards from the impact crater, and was approximately 170 yards wide.²⁰⁵ Nearly all the wreckage was located in the main debris field, with several items found beyond the main debris field up to 670 yards west of the impact crater, including a portion of the right engine.²⁰⁶ The wreckage was highly fragmented and scattered.²⁰⁷ Recovered systems wreckage showed no evidence of fire; fracture surfaces were consistent with overstress separation.²⁰⁸

1.5 Meteorological Conditions

Five weather monitoring stations in the vicinity of the accident site provided meteorological information regarding conditions at the time and site of the accident.²⁰⁹

At 11:53 a.m. CST, an Automated Surface Observing System (ASOS) at William P Hobby Airport (HOU) in Houston, 35 miles west of the accident location, reported wind from 310 degrees at 15 knots with gusts to 25 knots, visibility of 10 statute miles (or greater), light rain, few clouds at 1,800 feet above ground level (AGL), a broken ceiling at 2,500 feet AGL, broken clouds at 3,600 feet AGL, temperature 21° Celsius and dew point temperature 15° Celsius. It also reported that rain began at 11:23 a.m. CST and there were moderate rain showers in the vicinity to the northeast.²¹⁰

²⁰⁰ *Id.*

²⁰¹ Flight Data Recorder Specialists' Factual Report at 6, 14.

²⁰² Dkt. 65, Flight Data Recorder Specialists Factual Report at 6.

²⁰³ Dkt. 65, Flight Data Recorder Specialists Factual Report at 5.

²⁰⁴ Dkt. 63, Structures Group Chairman's Factual Report at 2.

²⁰⁵ *Id.*

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.* at 7.

²⁰⁹ Dkt. 38, Meteorology Factual Report at 5–8.

²¹⁰ *Id.* at 5.

At 11:13 a.m. CST, an ASOS at IAH, 41 miles west-northwest of the accident location, reported wind from 320 degrees at 18 knots with gusts to 24 knots, visibility of 8 statute miles, mist, scattered clouds at 1,600 AGL, a broken ceiling at 2,000 feet AGL, broken clouds at 2,900 feet AGL, temperature 19° Celsius and dew point temperature 12° Celsius. It also reported that rain began at 11:01 a.m. CST and ended at 11:13 a.m. CST, moderate rain showers in the vicinity to the southeast through south, trace amount of liquid equivalent precipitation since 10:53 a.m. CST, temperature of 19.4° Celsius and dew point temperature of 12.2° Celsius.²¹¹

At 12:35 p.m. CST, a private weather station located at Dutton Lake, about seven miles west-northwest of the accident site, reported a temperature of 70° Fahrenheit, relative humidity of 68 percent, an average wind magnitude of 3 knots, an average wind direction of 039 degrees, and gust wind of 5 knots.²¹²

National Weather Service radar indicated a “fine line” formation extending southwest-to-northeast over the accident site at the time of the accident.²¹³ A fine line is a “narrow, elongated, non-precipitating echo. It is usually associated with thunderstorm outflows, fronts, or other density discontinuities.”²¹⁴

The cloud ceiling at the site of the crash was estimated at 3,500 feet.²¹⁵

1.6 Aircraft Information

1.6.1 Background

The airplane was a Boeing 767-375BCF, a twin-engine, wide-body, transport category airplane.²¹⁶ It was manufactured in 1992 as a passenger airplane and had winglets installed in 2010 while in service with a different operator.²¹⁷ Boeing converted the airplane to a freighter airplane in 2017, adding a main-deck cargo door and redesignating it as a Boeing Converted Freighter.²¹⁸ During the conversion at ST Aerospace Singapore, an aging airplane safety inspection and record review concluded that the general condition of the aircraft and its structure

²¹¹ *Id.* at 6.

²¹² *Id.* at 8.

²¹³ *Id.* at 9.

²¹⁴ *Id.* at 9 n.6.

²¹⁵ Dkt. 61, Airplane Performance Study at 3.

²¹⁶ Dkt. 63, Structures Group Chairman’s Factual Report at 2; Dkt. 64, Structures Group Chairman’s Factual Report Appendix A at Figure 1; Dkt. 1, Operational Factors/Human Performance Group Factual Report at 34, Figure 1.

²¹⁷ Dkt. 63, Structures Group Chairman’s Factual Report at 2.

²¹⁸ *Id.*

was “good.”²¹⁹ The airplane had an airworthiness certificate dated June 6, 2017.²²⁰ Atlas Air placed the airplane into operation in 2017.²²¹

1.6.2 Load

Atlas Air flight 3591 was operating for Amazon Air (formerly known as Amazon Prime Air) and transporting cargo for Amazon Prime and the U.S. Postal Service.²²² The baggage/cargo weight was 25,933 pounds, below the maximum allowable cargo weight of 123,072 pounds.²²³ No hazardous material or dangerous goods were loaded on the flight.²²⁴ Cargo was arranged pursuant to Atlas Air cargo load planning and weight and balance computations, which were made through a System Automated Balance and Load Engineering Computerize Weight and Balance system, along with a system-generated weight and load balance sheet form for the flight.²²⁵ The load plan contained cargo positions, gross weight, and destination information for ground crews who loaded and offloaded the cargo.²²⁶

StratAir personnel prepared the cargo pallets and transported them to the airplane parking spot.²²⁷ They used two scales in the hangar for measuring the cargo weight; these scales were calibrated every 30 days and checked every day using a 1,000-pound concrete weight.²²⁸ National Airport Service personnel physically loaded the aircraft under the supervision of a StratAir Loadmaster, a StratAir load verifier, and an Atlas Air representative.²²⁹

The airplane had four cargo compartments: a main deck cargo compartment, a forward cargo compartment, an aft cargo compartment, and a bulk cargo compartment.²³⁰ The main cargo compartment, a Class E compartment, could carry pallets and containers, and had a load limit of 250 pounds per square foot.²³¹ It was loaded using the main deck side cargo door.²³²

²¹⁹ Dkt. 51, Maintenance Records Factual Report at 10–11.

²²⁰ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 34.

²²¹ Dkt. 51, Maintenance Records Factual Report at 6–7.

²²² Dkt. 1, Operational Factors/Human Performance Group Factual Report at 7, 43, 46.

²²³ *Id.* at 36.

²²⁴ *Id.* at 37.

²²⁵ *Id.* at 39.

²²⁶ *Id.* at 40, Figure 4.

²²⁷ *Id.* at 38.

²²⁸ *Id.*

²²⁹ *Id.* at 39.

²³⁰ *Id.* at 41, Figure 5.

²³¹ *Id.* at 42–43, Photos 5–6.

²³² *Id.* at 41.

The main deck was loaded with seven PAG and PAJ standard pallets.²³³ One empty pallet that weighed 220 pounds was loaded in the forward main deck (position A2 left) and six pallets were loaded in the aft section of the main deck (positions A10 through A13).²³⁴ The latter group of pallets contained 45” by 60” Gaylord cardboard boxes that were secured to each pallet by netting.²³⁵ These boxes contained cargo from Amazon Prime.²³⁶ The total weight of this cargo was 12,900 pounds.²³⁷

The forward and aft cargo compartments and bulk cargo compartments, Class C compartments, were located below the main cargo deck and had flooring covered by insulation blankets and fire-resistant linings.²³⁸ The lower forward and aft compartments had a floor load limit of 200 pounds per square foot.²³⁹ Eight DQF Unit Load Device (ULD) containers were loaded in the forward cargo compartment with a combined weight of 9,296 pounds.²⁴⁰ Seven ULD containers were loaded in the aft cargo compartment for a combined weight of 3,737 pounds, for a total weight of 13,033 pounds.²⁴¹ Seven of the ULDs contained mail for the U.S. Postal Service.²⁴² There was no cargo loaded in the bulk cargo compartment.²⁴³

The airplane’s cargo restraints included floor lock assemblies in the main cargo deck floor that were designed to provide restraint for ULDs, *i.e.*, the prevention of movement in four principal directions: forward, aft, vertical, and lateral.²⁴⁴ After loading and securing the main cargo pallets on flight 3591, cargo loaders placed unused floor lock assemblies on the main deck in the up position as an additional safety measure to mitigate the chance of a cargo shift.²⁴⁵

²³³ *Id.* at 43.

²³⁴ *Id.*

²³⁵ *Id.*

²³⁶ *Id.*

²³⁷ *Id.*

²³⁸ *Id.* at 44–45, Figure 2.6.21, Photo 8.

²³⁹ *Id.* at 44.

²⁴⁰ *Id.* at 45.

²⁴¹ *Id.*

²⁴² *Id.* at 46.

²⁴³ *Id.* at 45.

²⁴⁴ *Id.* at 47.

²⁴⁵ *Id.* at 48–49, Photos 11–12.

Following the crash, parts identified as components of the cargo containers, cargo loading, and securing systems were recovered from Trinity Bay.²⁴⁶ The Systems Group examined these parts and found no evidence of any pre-impact failures.²⁴⁷

1.6.3 Autothrottle Functioning

The airplane's thrust management system, or autothrottle, formed part of its automatic flight control system, along with the autopilot flight director system.²⁴⁸ It provided thrust control based on selected modes, existing conditions and engine limitations and could be operated whether or not the airplane's autopilot was activated.²⁴⁹

The flight deck thrust levers were located on the center control aisle stand and were connected to a servomotor generator and clutch pack assembly that allowed manual thrust inputs when overridden by manual throttle movement.²⁵⁰ Each throttle had an autothrottle disconnect button on the outboard side of the knob.²⁵¹ Pressing this button would disconnect the autothrottle.²⁵²

The autothrottle management system was controlled by the thrust management computer, which performed commands and calculations.²⁵³ Autothrottle functions depended on the mode selected by flight crew and the system could control thrust, Mach, airspeed, rate of altitude change, or throttle retard rate.²⁵⁴ The thrust management computer could also detect and transmit autothrottle failures and actuate the thrust levers.²⁵⁵

One of the thrust management system modes is the go-around mode.²⁵⁶

²⁴⁶ Dkt. 69, Systems Group Chairman's Factual Report at 50.

²⁴⁷ *Id.*

²⁴⁸ *Id.* at 23, 28.

²⁴⁹ *Id.* at 28.

²⁵⁰ *Id.*

²⁵¹ *Id.*

²⁵² *Id.*

²⁵³ *Id.* at 28–29.

²⁵⁴ *Id.*

²⁵⁵ *Id.*

²⁵⁶ *Id.* at 30.

1.6.4 Go-Around Mode and Switch

1.6.4.1 Go-Around Mode and Switch Description and Function

The go-around mode is typically selected when an airplane is approaching landing and the flight crew opts to abort the approach and “go around” for another attempt at landing.²⁵⁷ Two go-around switches (paddles) are located on the underside of throttle quadrant, below each of the throttle lever knobs.²⁵⁸ Activation of go-around mode causes the throttles to advance (adding power) to maintain a climb rate of at least 2,000 feet per minute, and causes the airplane’s autoflight system to pitch the airplane’s nose up.²⁵⁹ Activation of go-around mode is not aurally annunciated, and, once armed, it remains armed until the aircraft is nearly landed (two seconds after the airplane reaches five feet radio altitude).²⁶⁰

The Systems Group found no evidence of any pre-impact failure or damage for either of the two go-around switches.²⁶¹ Boeing’s examination of the go-around switch found that “the actuator arm on the right throttle single switch was depressed, depressing the associated switch.”²⁶² Boeing found no anomalies or discrepancies in the go-around switch assemblies.²⁶³

1.6.4.2 Possibility of Inadvertent Activation of the Go-Around Switch in Boeing 767 Aircraft

The NTSB surveyed the results of a search of Aviation Safety Reporting System (ASRS) data for any incidents reporting inadvertent activation of go-around mode.²⁶⁴ The search identified 11 incidents in which pilots reported the inadvertent activation of go-around mode, none of which were reported in a Boeing 767 aircraft.²⁶⁵ At least 8 of the 11 incidents occurred while the aircraft was descending or making its final approach.²⁶⁶

²⁵⁷ *Id.*

²⁵⁸ Dkt. 61, Airplane Performance Study at 2; Dkt. 69, Systems Group Chairman’s Factual Report at 30, Figure 12.

²⁵⁹ Dkt. 69, Systems Group Chairman’s Factual Report at 30–31.

²⁶⁰ *Id.* at 30.

²⁶¹ *Id.* at 34.

²⁶² Dkt. 71, System Group Chairman’s Factual Report, Attachment 2, at 6.

²⁶³ *Id.* Boeing found the presence of “high density material” determined to be outside the wiring insulation. *Id.* at 6, 14.

²⁶⁴ Dkt. 25, Operational Factors/Human Performance Group Factual Report, Attachment 24, NASA Aviation Safety Reporting System Search Request 7290, *Inadvertent Activation of Go-Around Mode Related to Incidents* (2019).

²⁶⁵ *Id.* at 6–7.

²⁶⁶ *Id.* As noted in the memorandum accompanying the ASRS data, and as recognized in the industry, underreporting is likely.

Atlas conducted an internal review of more than 22,000 Flight Crew Reports (FCRs) and Aviation Safety Action Program (ASAP) reports and identified three reports that involved possible inadvertent activation of the go-around switch on a Boeing 767 aircraft. In two of the reports, the pilot flying inadvertently engaged the go-around switch while attempting to disconnect the autothrottle.²⁶⁷ In the remaining report, the pilot flying inadvertently disconnected the autothrottle switch while attempting to engage the go-around switch.²⁶⁸ All three reported events occurred during final approach.²⁶⁹ None of the events reported described an inadvertent activation of go-around mode where the pilot was not attempting to engage another autopilot or autothrottle mode.

1.6.4.3 Recognition of Inadvertent Activation of Go-Around Mode

Go-around mode is armed when the flaps are selected and is normally used when an airplane is on final approach and the flight crew chooses to “go around” and attempt to land again.²⁷⁰ Go-around mode can only be activated if go-around mode is armed prior to engaging the go-around switch.²⁷¹ The arming of go-around mode is not annunciated.²⁷²

When go-around mode is armed, go-around mode is engaged when either go-around switch is activated.²⁷³ When go-around mode is engaged, the FMA and EICAS displays will annunciate go-around mode.²⁷⁴ There is no unique aural alert for activation of go-around mode.²⁷⁵

Atlas Air reviewed a report of an inadvertent activation of go-around mode that the crew did not recognize for an unknown period of time in its review of FCR and ASAP reports in connection with this submission.²⁷⁶ In the event described in that report, the pilot flying inadvertently activated go-around mode while on final approach in a Boeing 747-400 aircraft.²⁷⁷

²⁶⁷ Deidentified Flight Crew Event Report 720 (attached as Exhibit 3); Deidentified Flight Crew Event Report 1546 (attached as Exhibit 4).

²⁶⁸ Deidentified Flight Crew Event Report 3912 (attached as Exhibit 5).

²⁶⁹ Deidentified Flight Crew Event Report 720 (attached as Exhibit 3); Deidentified Flight Crew Event Report 1546 (attached as Exhibit 4); Deidentified Flight Crew Event Report 3912 (attached as Exhibit 5).

²⁷⁰ Dkt. 69, Systems Group Chairman’s Factual Report at 30.

²⁷¹ *Id.*

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 66.

²⁷⁵ See Dkt. 68, Cockpit Voice Recorder Sound Spectrum Study at 10 (“Beeper is used for all system alert caution messages.”).

²⁷⁶ Deidentified Flight Crew Event Report 2316 at 1 (attached as Exhibit 6).

²⁷⁷ *Id.*

The pilot flying in that case did not realize that go-around mode had been activated until after the go-around maneuver had been completed.²⁷⁸

1.6.5 Stall Warning System

The FAA Airplane Flying Handbook defines the key to stall awareness as “the pilot’s ability to visualize the wing’s angle of attack in any particular circumstance, and thereby be able to estimate his/her margin of safety above a stall.”²⁷⁹ The Boeing 767 includes multiple systems to assist pilots in that task and warn of an approach to stall or a fully developed stall. The FDR data shows that flight 3591 did not stall at any time during the flight.²⁸⁰

Both the left and right control columns have independent stick shakers that vibrate the respective control column in the event of a stall.²⁸¹ The system powering the stick shakers is energized whenever the aircraft was in flight.²⁸² Airspeed and minimum maneuvering speed are depicted on the Electronic Flight Instrument System (EFIS).²⁸³ The minimum maneuvering speed is calculated as the minimum speed needed to provide 1.3 g maneuvering capability.²⁸⁴

The EFIS also indicates the minimum operating speed, which is the minimum operating speed below which the stick shaker would activate.²⁸⁵ The EFIS displays a speed trend vector, which estimated the predicted airspeed in 10 seconds based on current acceleration or deceleration.²⁸⁶ When operating with flaps extended, the EFIS displays a pitch limit indicator, which indicates the maximum pitch before activating the stick shaker, as calculated by the stall warning computer.²⁸⁷

Atlas Air’s operations manuals states that pilots should consider a stick shaker, electronic stall warning, initial buffet, or rapid decrease of airspeed below V_{REF} during approach or a go-around as warning of a stall.²⁸⁸

²⁷⁸ *Id.*

²⁷⁹ FAA, Airplane Flying Handbook, FAA-H-8083-3A, at 1–6.

²⁸⁰ *See generally* Dkt. 65, Flight Data Recorder Specialist’s Factual Report.

²⁸¹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 71.

²⁸² *Id.*

²⁸³ *Id.* at 72.

²⁸⁴ *Id.*

²⁸⁵ *Id.* at 71–72.

²⁸⁶ *Id.* at 72.

²⁸⁷ *Id.*

²⁸⁸ Dkt. 28, Operational Factors/Human Performance Group Factual Report, Attachment 27, Atlas Air Stall Recovery Guidance at 2.

1.6.6 Navigation

The accident airplane was equipped with analog-display and electronic flight navigation instruments.²⁸⁹ Primary flight instruments on both the captain's (left) side and first officer's (right) side included round dial/indicator pneumatic instruments and cathode-ray tube (CRT) electronic flight instruments.²⁹⁰ Analog display instruments included airspeed/Mach indication, altimeter, vertical speed, radio/magnetic instrument, and clock.²⁹¹ Components of the Electronic Flight Instrument System (EFIS) included the horizontal situation indicator, attitude director indicator (including airspeed indication and flight mode annunciation), and integrated standby flight display.²⁹² The airplane's two engine indicating and crew alerting system (EICAS) displays were located between the captain and first officer, arranged vertically.²⁹³

Analog air data instruments displayed the airplane's altitude and airspeed based on the atmosphere outside the airplane.²⁹⁴ These instruments were pneumatic displays receiving information from the airplane's pitot and static system through the air data computers, while electronic displays received information from other avionic units using air data buses.²⁹⁵ Other analog instruments included the vertical speed indicator, radio magnetic indicator, and clock.²⁹⁶

Airspeed recorded by the flight data recorder is the airspeed data presented to the captain.²⁹⁷ The flight data therefore does not contain airspeed data presented to the First Officer, and it is not possible to determine whether the First Officer's airspeed indication experienced anomalies, for example, when the First Officer remarked "where's my speed my speed."²⁹⁸

The EFIS presented main displays for most of the airplane's navigation systems.²⁹⁹ Using two CRT multi-color displays on each of the captain's and first officer's displays (the Electronic Horizontal Situation Indicator (HSI) and Electronic Attitude Direction Indicator (ADI)), the EFIS displayed information such as pitch, roll, and directional data; map displays and flight path data; weather radar data; and input system fault annunciations.³⁰⁰

²⁸⁹ Dkt. 69, Systems Group Chairman's Factual Report at 41.

²⁹⁰ *Id.* at 41–42, Figure 16.

²⁹¹ *Id.* at 42.

²⁹² *Id.* at 42, 44.

²⁹³ *Id.* at 43.

²⁹⁴ *Id.* at 44.

²⁹⁵ *Id.*

²⁹⁶ *Id.*

²⁹⁷ See Flight Data Recorders, 14 C.F.R. § 25.1459(c) (2019).

²⁹⁸ See *supra* note 182 and accompanying text.

²⁹⁹ Dkt. 69, Systems Group Chairman's Factual Report at 44.

³⁰⁰ *Id.*

Information displayed on the EFIS can appear independently in symbols on the left, center, and right side of the instrument panel.³⁰¹ If a fault is detected on either the left (captain's) or right (first officer's) side, the display set can be switched to the center symbol generator.³⁰² An electronic flight instruments (EFI) switch selects the EFIS symbol generator, ILS receiver, and radio altimeter that provide information for the EADI and EHSI.³⁰³ When the switch is in the normal "blank" position, the source is that side's EFIS symbol generator, ILS receiver, and radio altimeter.³⁰⁴ When the EFI switch is set to the alternate (ALTN) position, the source shifts to the center symbol generator, center ILS receiver, and center radio altimeter.³⁰⁵

Videos of instrument source select change scenarios were created in this investigation.³⁰⁶ The videos of instrument source select change scenarios demonstrated the effect on EFIS instrument display when the EFI switches were changed.³⁰⁷ When the first officer's EFI source was switched from normal to ALTN, it took approximately two seconds for the center display to power up, during which time instruments on the right-side ADI and HSI were blank.³⁰⁸ In another video in which the center IRS failed, pressing the IRS button to select the ALTN (center) IRS as a source resulted in a blanked vertical speed indicator and a vertical speed fail flag.³⁰⁹ The lack of displayed information may contribute to spatial disorientation.³¹⁰

1.7 Miami Simulator Testing

NTSB conducted a simulator observation study of the accident flight at Atlas's simulator facility.³¹¹ The simulator observation studied whether accidental activation of go-around mode was possible by a pilot sitting in the right (first officer's) seat reaching to retract the speedbrakes.³¹² The simulator observation attempted to replicate an inadvertent activation of the

³⁰¹ *Id.* at 45.

³⁰² *Id.*

³⁰³ *Id.*

³⁰⁴ *Id.*

³⁰⁵ *Id.*

³⁰⁶ *Id.*

³⁰⁷ *Id.* at 45–46.

³⁰⁸ *Id.* at 46.

³⁰⁹ *Id.*

³¹⁰ See Dkt. 1, Operations/Human Performance Group Chairman's Factual Report at 78.

³¹¹ Dkt. 32, Operational Factors/Human Performance Group Factual Report, Attachment 31, MIA B767 Simulator Observation.

³¹² *Id.*

left go-around switch by the first officer's wrist.³¹³ The observer notes indicated "bumping go-around button with back of hand," but that the hand position would not be "natural."³¹⁴

The simulator observation also attempted to replicate an inadvertent activation of the go-around switch by the left (captain's) seat occupant reaching across the throttle to manipulate other controls.³¹⁵ The observer's notes do not reflect any observations regarding that potential sequence of events.³¹⁶

The simulator observation did not attempt to determine whether a first officer could have inadvertently activated the go-around switch while moving a hand from the speedbrake handle to the throttle to press the autothrottle disconnect button.³¹⁷

Overall, the simulator experimentation was inconclusive as to potential modes for inadvertent activation of a go-around switch.

1.8 Spatial Disorientation and Somatogravic Illusion

1.8.1 Background

Spatial disorientation is defined as when "the pilot fails to sense correctly the position, motion, or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the Earth and the gravitational vertical."³¹⁸ Atlas Air flight operations manuals note that spatial disorientation may cause an upset.³¹⁹

The somatogravic illusion is a subset of spatial disorientation that is caused by the incompatibility of the human vestibular system with the acceleration experienced during aircraft operation.³²⁰ The somatogravic illusion is an incorrect perception of attitude due to the brain misinterpreting longitudinal acceleration.³²¹ The somatogravic illusion is most likely to occur

³¹³ See *id.* at 22–38 (showing photographs of distance between wrist or watch of pilot seated in right/first officer seat and left go-around switch).

³¹⁴ *Id.* at 8.

³¹⁵ *Id.*

³¹⁶ See *id.*

³¹⁷ See generally *id.*

³¹⁸ Randall Gibb, Bill Ercoline, and Lauren Scharff, *Spatial Disorientation: Decades of Pilot Fatalities*, Aviation, Space, and Env'tl. Med., July 2008, at 1 (2011).

³¹⁹ Dkt. 29, Operations Attachment 28 - Atlas Air Upset Recovery Guidance at 2.

³²⁰ Simon Ludlow, Cathay Pacific Group Safety Department, *Reducing the Threat of the Somatogravic Illusion* 4 (2016).

³²¹ *Id.* at 5.

when a pilot lacks visual cues because of instrumental meteorological conditions or when flying at night.³²²

Spatial disorientation has been a leading cause of accidents for decades.³²³ The U.S. Naval Aviation Safety office released a study assessing the aeromedical causes of aviation mishaps between 1990 and 2008. It determined that the leading cause of accidents was spatial disorientation and that “visual illusions,” a subset of spatial disorientation, was the fourth most prevalent cause.³²⁴ A 2009 article noted that the rate of accidents associated with spatial disorientation has not substantially changed over time, despite the advent of improved technology and more robust training.³²⁵ In fact, in some instances, technology can increase the likelihood of the occurrence of spatial disorientation by increasing pilots’ confidence in their ability to interpret degraded visual cues.³²⁶

Spatial disorientation, and specifically the somatogravic illusion, is most likely to occur when a number of factors are present. First, because vision is the most important sense for establishing spatial orientation, most instances of spatial disorientation occur in a degraded visual environment.³²⁷ This includes both night VMC flying and all IMC flying. Second, the pilot must be able to refer to accurate instruments to maintain spatial awareness. In the absence of an operative attitude display, or with the belief that an operative attitude display is not functioning properly, “spatial disorientation may become severe.”³²⁸ This is particularly true with regard to the somatogravic illusion, in which linear acceleration interferes with the pilot’s ability to interpret the aircraft’s pitch correctly.

Spatial disorientation can affect pilots “regardless of a pilot’s proficiency or experience.”³²⁹ Various incarnations of spatial disorientation have been implicated in several recent incidents, including the following: a 2019 accident of a Japan Air Self Defense Force F-35 Joint Strike Fighter involving a pilot with 3,500 hours of experience;³³⁰ a 2018 U.S. Air Force

³²² *Id.*

³²³ Randall Gibb, Bill Ercoline, and Lauren Scharff, *Spatial Disorientation: Decades of Pilot Fatalities*, Aviation, Space, and Env’tl. Med., July 2008, at 1 (2011).

³²⁴ *Id.*

³²⁵ *Id.*

³²⁶ *Id.* at 5.

³²⁷ *Id.* at 1.

³²⁸ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 78.

³²⁹ Randall Gibb, Bill Ercoline, and Lauren Scharff, *Spatial Disorientation: Decades of Pilot Fatalities*, Aviation, Space, and Env’tl. Med., July 2008, at 1 (2011).

³³⁰ Brad Lendon & Yoko Wakatsuki, *Japan F-35 fighter crash: Pilot suffered ‘spatial disorientation,’* CNN (June 11, 2019), available at <https://www.cnn.com/2019/06/10/asia/japan-f-35-fighter-crash-cause-hnk-intl/index.html>.

F-15C accident off the coast of Japan;³³¹ a 2016 accident of a West Air Sweden CL-600-2B19 cargo flight in northern Sweden;³³² a 2012 accident of a U.S. Air Force F-15E Strike Eagle while deployed to Southwest Asia;³³³ a 2008 incident involving an Air Transat Airbus A310-308 in the vicinity of Quebec City, Quebec;³³⁴ and a 2000 accident involving a Gulf Air Airbus A320.³³⁵ All of these incidents occurred during visually degraded conditions: The Japan Air Self Defense Force,³³⁶ West Air Sweden,³³⁷ F-15E accident,³³⁸ and Gulf Air³³⁹ events occurred at night. The Air Transat incident occurred during takeoff in reduced visibility due to snow,³⁴⁰ and the F-15C

³³¹ Brian W. Everstine, *PACAF: Pilot Error Caused June 2018 F-15C Crash Near Kadena*, Air Force Magazine (Apr. 24, 2019), available at <https://www.airforcemag.com/pacaf-pilot-error-caused-june-2018-f-15c-crash-near-kadena/> (noting that “[c]ontributing factors included spatial disorientation”).

³³² Swedish Accident Investigation Authority, *Final report RL 2016:11e: Accident in Oajevágge, Norrbotten County, Sweden on 8 January 2016 involving the aeroplane SE-DUX of the model CL-600-2B19, operated by West Atlantic Sweden AB*, 9–10, 70–71 (Dec. 12, 2016), available at https://www.havkom.se/assets/reports/RL-2016_11e.pdf.

³³³ Tim Barela, *Spatial Disorientation Leads to F-15E Crash, Death of Pilot*, Torch (Apr. 23, 2015), available at <https://www.torch.aetc.af.mil/News/Article-Display/Article/364794/spatial-disorientation-leads-to-f-15e-crash-death-of-pilot/>.

³³⁴ Transportation Safety Board of Canada, *Aviation Investigation Report A08Q0051, Out-Of-Trim Nose Down Condition Leading to an Airplane Upset: Air Transat Airbus A310-308 C-GPAT, Quebec International Airport, 05 March 2008* (Nov. 5, 2010), available at <https://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08q0051/a08q0051.pdf>.

³³⁵ Accident Investigation Board (Bahrain), *Final Report – Gulf Air Flight GF-072 Airbus A320-212, REG. A40-EK on 23 August 2000*, available at <https://www.bea.aero/docspa/2000/a40-ek000823a/htm/a40-ek000823a.html>.

³³⁶ Brad Lendon & Yoko Wakatsuki, *Japan F-35 fighter crash: Pilot suffered ‘spatial disorientation’*, CNN (June 11, 2019), available at <https://www.cnn.com/2019/06/10/asia/japan-f-35-fighter-crash-cause-hnk-intl/index.html>.

³³⁷ Swedish Accident Investigation Authority, *Final report RL 2016:11e: Accident in Oajevágge, Norrbotten County, Sweden on 8 January 2016 involving the aeroplane SE-DUX of the model CL-600-2B19, operated by West Atlantic Sweden AB*, 9 (Dec. 12, 2016), available at https://www.havkom.se/assets/reports/RL-2016_11e.pdf.

³³⁸ Tim Barela, *Spatial Disorientation Leads to F-15E Crash, Death of Pilot*, Torch (Apr. 23, 2015), available at <https://www.torch.aetc.af.mil/News/Article-Display/Article/364794/spatial-disorientation-leads-to-f-15e-crash-death-of-pilot/>.

³³⁹ Accident Investigation Board (Bahrain), *Final Report – Gulf Air Flight GF-072 Airbus A320-212, REG. A40-EK on 23 August 2000*, available at <https://www.bea.aero/docspa/2000/a40-ek000823a/htm/a40-ek000823a.html>.

³⁴⁰ Transportation Safety Board of Canada, *Aviation Investigation Report A08Q0051, Out-Of-Trim Nose Down Condition Leading to an Airplane Upset: Air Transat Airbus A310-308 C-GPAT, Quebec International Airport, 05 March 2008*, 5 (Nov. 5, 2010), available at <https://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08q0051/a08q0051.pdf>.

accident occurred under conditions “where ragged clouds and sun glare obscured the horizon.”³⁴¹ In addition, the West Air Sweden incident occurred after the pilots observed erroneous attitude indications due to an instrument malfunction.³⁴²

The investigation of the Air Transat incident identified a number of specific factors relevant to the onset of spatial disorientation. These included the combination of nose-down attitude and longitudinal acceleration inducing the somatogravic illusion in the captain (pilot flying),³⁴³ the unexpected increase in airspeed causing the captain to incorrectly diagnose an airspeed indicator error,³⁴⁴ and the possibility that the captain’s fixation on the airspeed indicator prevented him from adequately monitoring the other instruments.³⁴⁵ A subsequent review of the FDR indicated that the airspeed indicator had displayed the correct airspeed at all relevant times.³⁴⁶ The report also noted that the captain had inadvertently activated the Go Levers (which serve the same function as go-around switches on an A310 aircraft), which increased thrust and likely contributed to the captain’s incorrect assessment that the airspeed indicator had failed.³⁴⁷

1.8.2 Apparent Pitch During Flight 3591 Accident Sequence

The accident sequence in the case of flight 3591 began between 12:38:25 p.m. CST, when it encountered turbulence,³⁴⁸ and 12:38:31 p.m. CST, when its recorded flight path intersected with the fine line cloud formation depicted on weather radar³⁴⁹ and the go-around switch was activated.

³⁴¹ United States Air Force Aircraft Accident Investigation Board Report, F-15C, T/N 84-0008, 23 (June 11, 2018), available at https://www.airforcemag.com/PDF/AircraftAccidentReports/Documents/2019/06112018_F15C_Kadena.PDF.

³⁴² Swedish Accident Investigation Authority, *Final report RL 2016:11e: Accident in Oajevágge, Norrbotten County, Sweden on 8 January 2016 involving the aeroplane SE-DUX of the model CL-600-2B19, operated by West Atlantic Sweden AB*, 10 (Dec. 12, 2016), available at https://www.havkom.se/assets/reports/RL-2016_11e.pdf.

³⁴³ Transportation Safety Board of Canada, *Aviation Investigation Report A08Q0051, Out-Of-Trim Nose Down Condition Leading to an Airplane Upset: Air Transat Airbus A310-308 C-GPAT, Quebec International Airport, 05 March 2008*, 34 (Nov. 5, 2010), available at <https://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08q0051/a08q0051.pdf>.

³⁴⁴ *Id.*

³⁴⁵ *Id.* at 35.

³⁴⁶ *Id.*

³⁴⁷ *Id.* at 34.

³⁴⁸ Dkt. 61, Airplane Performance Study at 2–3.

³⁴⁹ Dkt. 38, Meteorology Factual Report at 14.

The go-around switch was activated at 12:38:31 p.m. CST.³⁵⁰ Between 12:38:31 and 12:38:37 p.m. CST, the aircraft pitch increased from approximately 2 degrees nose-down to approximately 5 degrees nose-up.³⁵¹ The accident investigation determined that, between 12:28:31 and 12:28:43 p.m. CST, the linear acceleration and actual pitch of flight 3591 would have caused the First Officer and Captain to perceive an apparent pitch of up to a maximum of 80 degrees nose-up.³⁵² This time period matches the span during which the First Officer commanded the elevators nose-down.³⁵³

The apparent pitch perceived by the crew would have abruptly shifted between 12:38:42 and 12:38:47 p.m. CST, going from 60 degrees nose-up to approximately 5 degrees nose-down.³⁵⁴ The apparent pitch reached its maximum at 12:48:47,³⁵⁵ which is the same time at which one of the crew, likely the First Officer, increased the thrust to maximum after it had been manually reduced.³⁵⁶ At approximately 12:38:55 p.m. CST, the apparent pitch would have matched the aircraft's actual pitch.³⁵⁷ Also at 12:38:55 p.m. CST, the First Officer began to command the elevator nose up.³⁵⁸

2. Analysis

2.1 Overview

The probable cause of the accident was the First Officer's inappropriate control inputs, likely as a result of an unrecognized somatogravic illusion. The somatogravic illusion was caused by the acceleration of the aircraft that was, in turn, caused by the activation of go-around mode during the descent. The First Officer may have inadvertently activated the go-around mode while attempting to retract the speedbrake or disconnect the autothrottle after encountering turbulence and transitioning to IMC. Alternatively, the First Officer may have intentionally activated go-around mode after the advent of spatial disorientation in an attempt to increase thrust.³⁵⁹ The First Officer may also have experienced an instrumentation error, making it impossible to fly by reference to instruments alone.

³⁵⁰ Dkt. 65, Flight Data Recorder Specialists Factual Report at 14.

³⁵¹ Dkt. 61, Airplane Performance Study at 9.

³⁵² *Id.* at 12.

³⁵³ Dkt. 65, Flight Data Recorder Specialists Factual Report at 14.

³⁵⁴ Dkt. 61, Airplane Performance Study at 12.

³⁵⁵ *Id.*

³⁵⁶ Dkt. 65, Flight Data Recorder Specialists Factual Report at 14.

³⁵⁷ Dkt. 61, Airplane Performance Study at 12.

³⁵⁸ Dkt. 65, Flight Data Recorder Specialists Factual Report at 14.

³⁵⁹ The flight data indicate that the elevators moved up approximately one second prior to the activation of the go-around switch.

A contributing factor was the Captain's delayed reaction to the First Officer's inappropriate control inputs and the Captain not assuming command of the aircraft. Although the Captain appears to have eventually recognized the inappropriate control inputs and attempted to counteract the First Officer's nose-down commands, the Captain did not vocalize a change in control of command of the aircraft.

Both pilots were highly trained and Atlas's training regimen provided the pilots with the skills necessary to complete the flight successfully. The First Officer's control inputs on the accident flight are not any part of Atlas's training curriculum. Instead, they likely reflect the reaction of the First Officer to a perception that the aircraft was 80 degrees nose up. Although both pilots had experienced training challenges at periods in their careers, both had adequately completed the supplemental training necessary to meet all applicable standards.

2.2 Flight Crew Preparedness and Performance

2.2.1 Hiring Procedures

2.2.1.1 Atlas Hiring Generally

Atlas followed the customary and appropriate hiring procedures with respect to both the Captain and First Officer. Atlas, like many major air carriers, has experienced a decline in applicants from which to select pilots. Atlas reacted by initiating programs to identify qualified candidates proactively.³⁶⁰ Atlas's hiring procedures have proven effective at filling pilot classes with qualified candidates.³⁶¹ The company has made a concerted effort to maintain its hiring and training standards.³⁶²

2.2.1.2 Atlas PRIA Procedures

Atlas complied with the requirements of PRIA in requesting and reviewing PRIA records for both the Captain and First Officer.

The First Officer failed to disclose his prior employment and failed training at Air Wisconsin and CommutAir. This background was relevant information that the First Officer failed to disclose on his application. Atlas's Chief Pilot and Director of Human Resources both stated that failure to disclose such information on an application would have constituted grounds for not hiring the First Officer.³⁶³ The First Officer's failed training at Air Wisconsin and CommutAir also fell outside of PRIA's five-year window such that Atlas could not have

³⁶⁰ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 17:16–19:21.

³⁶¹ See *id.* at 19:19–21, 49:11–50:13; see also Dkt. 1, Operational Factors/Human Performance Group Factual Report at 26–27.

³⁶² See *supra* note 29 and accompanying text.

³⁶³ See *supra* note 117 and accompanying text.

requested this information through the PRIA process.³⁶⁴ For a thorough review of a pilot's training record, PRIA's five-year period is insufficient.

A fully implemented Pilot Records Database that (1) verifies and keeps past employer records since 2010; (2) reports those records in a standardized format; and (3) reflects records beyond PRIA's five-year window would greatly enhance the information available to air carriers during the hiring process. The Pilot Records Database would reflect all past employers, and employers would send records directly to the FAA clearinghouse. If a pilot failed to disclose past employment, the past employment would appear the Pilot Records Database Output of Records report. If the Pilot Records Database had been in place, it is highly likely that Atlas would have been aware of the First Officer's past employment, would have had additional information related to training failures, and would not have hired the pilot due to his failure to disclose the past employment and training failures. Additionally, because such a report would be in a standardized format, air carriers would not be required to interpret handwritten or ambiguous notes from past training, such as the First Officer's record from Mesa Airlines.

These priorities are supported by practical experience: When asked what potential changes to PRIA she would recommend from a human performance standpoint in order to help accurately assess pilot backgrounds, Atlas's Director of Human Resources stated, "I do like the idea of a main database so that you're not missing a carrier, because if they don't divulge it, it's very hard to—there's no way to get the information if you don't know they work there."³⁶⁵ She also stated, "I would like to see some sort of standard reporting so you're not looking for past fails and unsat[isfactions] and sat[isfactions] that you can hardly read [and the information is in] a more standardized, easy-to-access format."³⁶⁶

Congress mandated the development of the Pilot Records Database in 2010 after a series of accidents, including most relevantly the Colgan accident near Buffalo on February 12, 2009.³⁶⁷ In that investigation, the Board found that a pilot's past training history was not adequately disclosed by the PRIA process.³⁶⁸ Unfortunately, a decade later, the Pilot Records Database is still not fully functional and the same concern remains unaddressed.³⁶⁹

³⁶⁴ See generally 49 U.S.C. § 44703(h)(3) ("A person shall not furnish a record in response to a [PRIA records request] if the record was entered more than 5 years before the date of the request, unless the information concerns a revocation or suspension of an airman certificate or motor vehicle license that is in effect on the date of the request.").

³⁶⁵ Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Denise Borrelli Tr. 40:21–24.

³⁶⁶ *Id.* at 40:24–41:2.

³⁶⁷ See generally NTSB, Accident Report NTSB/AAR-10/01, PB2010-910401, *Loss of Control on Approach, Colgan Air, Inc.* (2010).

³⁶⁸ *Id.*

³⁶⁹ See, e.g., Dkt. 18, Operational Factors/Human Performance Group Factual Report, Attachment 17, FAA Interview Summaries at 5, Chris Morris (FAA) interview ("[The FAA

Following the accident, Atlas has instituted an additional review of all PRIA files by flight operations in addition to the review by Atlas's designated agent and human resources. This change is intended to address situations where flight operations may be able to identify an ambiguous record in need of further examination, such as the Mesa Airlines record related to the First Officer's unsuccessful attempt to upgrade to captain. Atlas believes that problems related to ambiguous records could be more efficiently addressed through the use of a standardized record format for PRIA records. A central database—such as a fully implemented Pilot Records Database—could solve the pilot records problems identified in this investigation, including ambiguous records and a pilot's failure to disclose a past employer.³⁷⁰

2.2.2 Training Program

2.2.2.1 Atlas Training Program

Atlas's training program as set forth in the Atlas Air FOTM is approved by the FAA.³⁷¹ Atlas followed all training program procedures for both the Captain and First Officer, and the check airmen the NTSB interviewed stated that both the Captain and First Officer met the relevant standards before being placed on the line.³⁷² Although the First Officer's record includes training challenges, in each instance the First Officer received remedial training as outlined in the Atlas Air Remedial Training Protocol and subsequently passed. Notably, none of the First Officer's training challenges involved stall awareness and recovery.³⁷³

Once the First Officer was hired and passed Atlas's ground and simulator training, the First Officer had no issues with the operational experience portion of his training or with any recurrent checks. The First Officer consistently demonstrated proficiency.

2.2.2.2 Atlas PWP Procedures

The Captain was placed in the PWP while the First Officer was not due to the change in the PWP program in 2016. The PWP is not meant to be punitive, but to identify pilots who can be successful and who would benefit from additional monitoring and training. Atlas followed usual PWP practice in choosing to monitor the First Officer's operational experience portion of

representative] said there were four stages of implementation of PRD, and they were in stage 3, which was voluntary use. Stage 4 was next, and would include industry records.”).

³⁷⁰ See *id.* at 5–6 (“When asked if the intent of PRD records would be limited to 5 years like PRIA, [the FAA representative] said that when Congress developed the requirement for it back in 2010, the agency notified all industry stakeholders that a part of the vision was record keeping from that point forward to be entered into PRD.”).

³⁷¹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 18.

³⁷² See generally Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts.

³⁷³ See Dkt. 13, Operational Factors/Human Performance Group Factual Report, Attachment 12, Atlas Training Records - First Officer; Dkt. 67, Cockpit Voice Recorder Group Chairman's Factual Report at 51 (First Officer stating, “we're stalling” and “stall.”).

his training before deciding whether to place the First Officer into the PWP. The First Officer went on to perform his operational experience training and post-training line checks without issue, and therefore was not placed into the PWP.

A potentially analogous accident is the American Airlines flight 587 accident in New York in 2001, where the vertical stabilizer separated in flight due to excessive loads created by the first officer's unnecessary and excessive rudder inputs.³⁷⁴ The pilots of flight 587, like Atlas's, had multiple years of experience without demonstrating significant issues, and like the accident flight here, the first officer reacted surprisingly to an unexpected situation and the captain did not take control of the plane in time. In contrast to flight 587, where the first officer had demonstrated a history of aggressive use of the rudder pedals and issues with wake turbulence, Atlas had not observed a history of the First Officer reacting as he did in the accident sequence.³⁷⁵ Neither the Captain's nor the First Officer's training history indicated that the pilots would react as they did in the accident flight.

2.3 Activation of Go-Around Mode

The activation of go-around mode during descent set in motion the chain of events that led to the accident. The Systems Group investigation determined that the right go-around switch was engaged.³⁷⁶ Because the FDR only recorded a single instance of go-around mode being engaged, this likely indicates that right (First Officer's) go-around switch activated go-around mode. The First Officer may have inadvertently activated go-around mode while attempting to disconnect the autothrottle after encountering turbulence and transitioning to IMC. This would have been consistent with the training provided by Atlas Air in the event of an upset or severe turbulence, although in this instance the aircraft experienced only light turbulence. Alternatively, the First Officer may have intentionally activated the go-around switch believing, due to spatial disorientation, that the aircraft needed additional thrust.

2.3.1 Inadvertent Activation of the Go-Around Mode

The First Officer may have inadvertently activated go-around mode.

³⁷⁴ NTSB Accident Report NTSB/AAR-04/04, PB2004-910404, *In-Flight Separation of Vertical Stabilizer, American Airlines 160* (Nov. 12, 2001).

³⁷⁵ See, e.g., *id.* at 12–13 (“An American Airlines captain who flew several times with the first officer . . . told Safety Board investigators that, during one flight sometime in 1997, the first officer had been ‘very aggressive’ on the rudder pedals after a wake turbulence encounter.”). The investigation revealed a potentially similar reaction by the First Officer during training at Air Wisconsin where the First Officer “disengaged the autopilot and abruptly pitched down well below the horizon.” Dkt. 3, Operational Factors/Human Performance Group Factual Report, Attachment 2, Records of Conversation at 3, Christian Hutchcroft (Atlas Air) conversation. This information was unknown to Atlas before the accident investigation.

³⁷⁶ Dkt. 71, System Group Chairman's Factual Report, Attachment 2, at pages 6, 13; *id.* at Figures 7, 19, 22 and 25.

One possible sequence of events leading to the activation of the go-around switch would have begun when the First Officer moved his left hand from the speedbrakes to the center column in order to press the autothrottle disconnect button located on the throttle upon encountering turbulence and transitioning to instrumental meteorological conditions at 12:38:31 p.m. CST. The First Officer would have had his left hand on the speedbrake handle prior to 12:38:31 p.m. CST, as Atlas Air procedures require the pilot flying to maintain positive control of the speedbrake handle while the speedbrakes are engaged.

Due to the position of the autothrottle disconnect on the throttle, a person seated in the First Officer's seat would use the left thumb to disconnect the autothrottle using the autothrottle disconnect button on the side of the throttle levers.³⁷⁷ The autothrottle, however, remained engaged for the entire accident sequence.³⁷⁸ The left thumb is also used to engage the go-around button on the underside of the throttle levers.

A second possibility is that the First Officer inadvertently activated the go-around switch while manipulating the speedbrakes. The simulator observation attempted to recreate this scenario, but the results were inconclusive.³⁷⁹ The observer's noted that efforts to bump the go-around button required the hand to be in an unnatural position.³⁸⁰ In addition, the speedbrakes were not retracted until four seconds after the go-around mode had been activated, indicating that the First Officer's motion to retract the speedbrakes was not the cause of the go-around activation.³⁸¹

It is unlikely that the Captain would have activated the right go-around switch.³⁸² Although the investigation considered whether the Captain could have inadvertently activated the right go-around switch while manipulating other controls, there is a lengthy delay between the flap selection at 12:38:04 p.m. CST and the activation of go-around mode at 12:38:31 p.m. CST.³⁸³ Second, the investigation uncovered no reports of inadvertent activation of the go-around mode while manipulating the flaps.

2.3.2 Intentional Activation of Go-Around Mode

The First Officer may have purposefully activated go-around mode. The First Officer may have begun suffering from spatial disorientation earlier, at approximately 12:38:25 p.m. CST, and intentionally activated the go-around switch believing that the aircraft needed additional thrust. The First Officer may have become disoriented as the result of looking down

³⁷⁷ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 65.

³⁷⁸ *Id.*

³⁷⁹ Dkt. 32, MIA B767 Simulator Observation at 6–7.

³⁸⁰ *Id.* at 7.

³⁸¹ See Dkt. 65, Flight Data Recorder Specialist's Factual Report at 14.

³⁸² See generally Dkt. 32, MIA B767 Simulator Observation.

³⁸³ Dkt. 65, Flight Data Recorder Specialist's Factual Report at 14.

at his instrument display and transitioning from visual flying conditions to instrument flying conditions when entering the clouds.

2.3.3 Recognition of Go-Around Mode

The Captain likely did not realize that go-around mode had been engaged. Neither the Captain nor the First Officer verbally acknowledged the activation of go-around mode during the 30 seconds between activation and the accident.³⁸⁴ Atlas procedures require a go-around to be announced aurally when a go-around is performed.³⁸⁵ Moreover, the go-around mode is designed to be engaged at low altitude on final approach, not during vectors in the terminal area, and Atlas's training is consistent with this intended use. Atlas does not train its pilots to engage go-around mode during flight maneuvers, so the initiation of the go-around mode while at more than 6,000 feet would have been unexpected by the pilots. Although go-around mode was annunciated on the display, at least one report indicated that unexpected activation of the go-around mode can be unnoticed.³⁸⁶

2.3.4 The First Officer's Response

After activation of go-around mode, the aircraft would have pitched nose up automatically. The First Officer incorrectly diagnosed the reason for the change in pitch as an upset or stall, including incorrectly calling out "stall."³⁸⁷

2.4 Spatial Disorientation and Somatogravic Illusion

The First Officer would have been at maximum risk for suffering from the somatogravic illusion immediately after the activation of go-around mode because of the combination of lack of visual reference, turbulence, and acceleration caused by the activation of go-around mode. The First Officer's comments at 12:38:45 p.m. CST—"where's my speed my speed"—may have reflected that the airspeed indicator failed or that the First Officer perceived that the flight instruments were providing incorrect information.³⁸⁸ In addition, the apparent instrument failure or anomaly that occurred approximately 60 seconds before the activation of go-around mode may have contributed to the onset of somatogravic illusion. The failure may have caused the

³⁸⁴ Dkt. 67, Cockpit Voice Recorder Group Chairman's Factual Report at 48–51.

³⁸⁵ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 82.

³⁸⁶ Deidentified Flight Crew Event Report 3912 at 1–2 (attached as Exhibit 5).

³⁸⁷ Dkt. 67, Cockpit Voice Recorder Group Chairman's Factual Report at 50.

³⁸⁸ See *id.* at 50. The factual report notes that the word "where's" is a questionable insertion. See *id.* at 10, 50. Cf. Transportation Safety Board of Canada, Aviation Investigation Report A08Q0051, *Out-Of-Trim Nose Down Condition Leading to an Airplane Upset: Air Transat Airbus A310-308 C-GPAT, Québec International Airport/Jean Lesage, Quebec, 05 March 2008*, 34–35 (Nov. 5, 2010), available at <https://www.tsb.gc.ca/eng/rapports-reports/aviation/2008/a08q0051/a08q0051.pdf> (noting that the pilot was "preoccupied by the aircraft's increasing speed" and experiencing a somatogravic illusion, contributing to his failure to effectively monitor the instrument panel).

First Officer to doubt whether the instruments were correctly displaying the true attitude of the aircraft.

The Captain either did not experience spatial disorientation or recovered from its effects more quickly than the First Officer.³⁸⁹ If the First Officer experienced an instrumentation anomaly or failure, it is likely that the Captain's instrumentation remained unaffected. The split elevators during the steep nose-down descent indicate that the Captain likely recognized that the nose-down control inputs were inappropriate and sought to counteract the First Officer's control inputs. In addition, the dramatic reduction in thrust at 12:38:46 p.m. CST was most likely the result of the Captain correctly identifying the aircraft's attitude and reducing thrust.³⁹⁰ At the same time, the Captain began commanding the elevator nose up.³⁹¹ The Captain failed to verbalize his perceptions regarding the aircraft's nose-down pitch or speed.

Less than three seconds later, the thrust was increased to maximum power on both engines in less than two seconds.³⁹² This is likely the result of the First Officer, still suffering from the effects of spatial disorientation, increasing engine thrust in the mistaken belief that the aircraft required more power to recover. The increase in thrust between 12:38:48 and 12:38:50 p.m. CST was not likely caused by the function of go-around mode. Go-around mode increases thrust gradually to achieve a 2,000 foot per minute climb.³⁹³ The profile of the gradual increase in thrust between 12:38:31 and 12:38:38 p.m., CST, which was caused by go-around mode, differed significantly from the rapid increase in thrust between 12:38:48 and 12:38:50 p.m. CST, which was more likely caused by manual manipulation of the thrust levers.³⁹⁴

The timing of the input on the elevator controls and thrust suggests that the Captain maintained or regained situational awareness with respect to the attitude and speed of the aircraft immediately after he finished the series of radio transmissions.³⁹⁵

The First Officer would have likely recovered from the effects of spatial disorientation immediately upon returning to VMC and establishing a visual reference when the aircraft exited the cloud layer. The cloud ceiling was determined to be approximately 3,500 feet.³⁹⁶ The

³⁸⁹ See Dkt. 61, Airplane Performance Study at 11 (showing that the pilot monitoring/Captain began to command the elevator nose up no later than 12:38:47 p.m. CST).

³⁹⁰ See Dkt. 65, Flight Data Recorder Specialist's Report at 14.

³⁹¹ *Id.*

³⁹² *Id.*

³⁹³ Dkt. 1, Operational Factors/Human Performance Factual Report at 66.

³⁹⁴ See Dkt. 65, Flight Data Recorder Specialist's Report at 14.

³⁹⁵ See *id.* (showing that the thrust is reduced at 12:38:36 and the elevator begins to split at 12:38:47 p.m. CST); Dkt. 67, Cockpit Voice Recorder Group Chairman's Factual Report at 49 (showing that the Captain made his final transmission at 12:38:47 p.m. CST).

³⁹⁶ See Dkt. 38, Meteorology Factual Report at 5–7 (assessing conditions at HOU, IAH, BPT, and BMT at the time of the incident).

aircraft descended below 3,500 feet at 12:38:55 p.m. CST.³⁹⁷ The First Officer began to command nose up at 12:38:55 p.m. CST.³⁹⁸ The aircraft's nose-down pitch decreased from 49 degrees nose-down to 16 degrees nose-down between 12:38:55 and 12:39:03 p.m. CST.³⁹⁹ Unfortunately, there was not enough available altitude to complete the recovery maneuver. The aircraft impacted the ground at approximately 12:39:03 p.m. CST.⁴⁰⁰

2.5 Other Potential Factors Considered

Atlas considered other potential causes for an airplane's sudden 49 degree pitch downward, including the following: (1) a mechanical or system failure affecting the flight controls or (2) a significant load shift in which the airplane's cargo shifted forward, altering the center of gravity of the aircraft. For the reasons explained below, Atlas does not believe either of these scenarios occurred during flight 3591.

2.5.1 Mechanical or System Failure

This investigation has not identified any mechanical or system failures that may have contributed to the crash. Prior to the accident, the aircraft was maintained in accordance with applicable regulations and the Atlas Air Maintenance Program, which Atlas monitored through its Continuing Analysis and Surveillance Program.⁴⁰¹ All applicable airworthiness directives had been performed and the investigation found no discrepancies in Atlas's records.⁴⁰² An aging airplane safety inspection and record review completed in 2017 during the airplane's passenger-to-cargo conversion concluded that "the general condition of the aircraft along with the structure was good."⁴⁰³ Moreover, a transit check completed prior to the accident flight did not uncover any discrepancies.⁴⁰⁴

During the flight and the accident sequence, flight controls responded normally. There is no evidence on the CVR transcript or the FDR data that an issue affected flight controls.

³⁹⁷ Dkt. 61, Airplane Performance Study at 3; Dkt. 65, Flight Data Recorder Specialists' Factual Report at 14.

³⁹⁸ Dkt. 61, Airplane Performance Study at 3, 11; Dkt. 65, Flight Data Recorder Specialists' Factual Report at 14.

³⁹⁹ Dkt. 61, Airplane Performance Study at 12; Dkt. 65, Flight Data Recorder Specialists' Factual Report at 6, 14.

⁴⁰⁰ Dkt. 65, Flight Data Recorder Specialists' Factual Report at 6, 14.

⁴⁰¹ Dkt. 51, Maintenance Records Group Factual Report at 8–12.

⁴⁰² *Id.* at 13–15.

⁴⁰³ *Id.* at 10–11.

⁴⁰⁴ *Id.* at 10.

Following the accident, recovered systems components did not reflect evidence of a pre-impact failure.⁴⁰⁵ Likewise, fragments of both airplane engines did not have indications of an in-flight fire, case rupture, or uncontainment.⁴⁰⁶ Damage to the engines was consistent with both of them operating at the time of the crash.⁴⁰⁷ More generally, the airplane's structural fracture surfaces were consistent with overstress separation.⁴⁰⁸

2.5.2 Forward Load Shift

Likewise, this investigation has not identified evidence that a forward shift in the cargo caused the airplane's nose to pitch downward before impact. Before takeoff, the aircraft was loaded in accordance with applicable regulations and Atlas Air cargo load planning and weight and balance computations.⁴⁰⁹ Also, as noted above, the cargo load was light—only 25,933 pounds of cargo, far below the maximum allowable cargo weight of 123,072 pounds.⁴¹⁰ Cargo loaders verified that floor lock assemblies on the main cargo deck were in the up position to prevent cargo from shifting during flight.⁴¹¹

During flight, the airplane's flight controls responded normally, particularly when the crew commanded nose up near the end of the accident sequence, and the airplane's nose down pitch decreased from approximately 49 degrees nose-down to approximately 16 degrees nose-down just prior to impact.⁴¹² If a forward load shift caused the airplane to pitch nose-down, it is unlikely that the flight controls would have been able to reduce the nose-down pitch at the end of the accident sequence. Moreover, the investigation found that the cargo loading and securing systems did not reflect evidence of pre-impact failures.⁴¹³

2.6 Post-Accident Enhancements to Hiring and Training Programs

In an effort to learn from the accident and consistent with its focus on improving airline safety, Atlas has instituted new procedures and enhanced other existing procedures. These changes include the following:

⁴⁰⁵ Dkt. 69, Systems Group Chairman's Factual Report at 4.

⁴⁰⁶ Dkt. 62, Powerplants Group Chairman's Factual Report at 2.

⁴⁰⁷ *Id.*

⁴⁰⁸ Dkt. 63, Structures Group Chairman's Factual Report at 7.

⁴⁰⁹ Dkt. 1, Operational Factors/Human Performance Group Factual Report at 40, 46–47.

⁴¹⁰ *Id.* at 36.

⁴¹¹ *Id.* at 47, Photos 11–12.

⁴¹² Dkt. 61, Airplane Performance Study at 9; Dkt. 65, Flight Data Recorder Specialists' Factual Report at 6, 14.

⁴¹³ Dkt. 69, Systems Group Chairman's Factual Report at 50.

- Creating an enhanced standard operating procedure for its pilot selection process.⁴¹⁴
- Revising its interview process to include a telephone screening interview where interview grading questions are asked over the telephone to gauge credibility and consistency in the applicant's answers during the formal interview.⁴¹⁵
- Instituting a flight operations review of the PRIA record of all new hire pilots.⁴¹⁶
- Conducting a pilot logbook review as part of its pilot selection process to obtain a better perspective of an applicant's overall career trajectory.⁴¹⁷
- Separating the Fleet Captain position of the 747 and 767 fleets into two separate positions to lessen and equalize workload.
- Adding a Safety and Regulatory Compliance representative to weekly fleet meetings.
- Adding the pilot selection process—including PRIA review—to the list of regular Safety and Regulatory Compliance audits.⁴¹⁸

In addition, Atlas has made a series of changes to the training of crewmembers, as detailed in Flight Operations Training Manual Bulletin 77.⁴¹⁹ Relevant highlights of the Bulletin include the following:

- Formalizing training review mechanisms and enhancing the existing process for the Training Review Board (TRB).⁴²⁰

⁴¹⁴ Atlas Air Worldwide, *Pilot Selection Process* (2019) (attached as Exhibit 1).

⁴¹⁵ See Dkt. 1, Operational Factors/Human Performance Group Factual Report at 27.

⁴¹⁶ See Atlas Air Worldwide, *Pilot Selection Process* at 8.

⁴¹⁷ See Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 1, Atlas Air Interview Transcripts, Scott Anderson Tr. 37:20–38:6.

⁴¹⁸ Atlas Air consistently meets or exceeds the audit requirements of industry regulators, including the International Air Transport Association, the U.S. Department of Defense (DOD), and foreign regulatory authorities. In 2017, Atlas completed a biennial IATA Operational Safety Audit (IOSA). Atlas successfully completed its most recent DOD audit in 2018. DOD audits are also performed biennially such that each year Atlas Air completes either an IOSA or DOD audit.

⁴¹⁹ See Atlas-Polar-Southern FOTM, Bulletin 77 (2019) (attached as Exhibit 2).

⁴²⁰ *Id.* at 4; see also Dkt. 1, Operational Factors/Human Performance Group Factual Report at 18; Dkt. 2, Operational Factors/Human Performance Group Factual Report, Attachment 2, Atlas Air Interview Transcripts, Mark Hoover Tr. 21:22–23:12; *id.* Joseph Diedrich Tr. 37:9–41:15.

- Significant changes to the PWP designed to provide additional clarity and to make the program more prescriptive.⁴²¹
- Inclusion and clarification of the PRIA workflow in Atlas's FOTM.⁴²²

3. Conclusions

3.1 Findings

1. The accident sequence began when the go-around mode was activated.
2. The First Officer was suffering from spatial disorientation and somatogravic illusion induced by the lack of visual reference and linear acceleration caused by the activation of go-around mode, causing him to experience an apparent pitch of up to 80 degrees nose-up.
3. The Captain did not recognize that go-around mode had been activated.

3.2 Probable Cause

The probable cause of the accident was the First Officer's inappropriate control inputs, likely as a result of an unrecognized somatogravic illusion. The somatogravic illusion was caused by the acceleration of the aircraft that was, in turn, caused by the activation of go-around mode during the descent.

A contributing factor was the Captain's failure to recognize promptly the First Officer's inappropriate control inputs and assume command of the aircraft. Although the Captain appears to have recognized the inappropriate control inputs and attempted to overpower the First Officer's nose-down commands, the Captain did not aurally take command of the aircraft.

3.3 Safety Recommendations

1. To the FAA: Require air carriers to implement ground and simulator training to recognize spatial disorientation/somatogravic illusion induced by sudden unexpected acceleration.
2. To Boeing: Make the activation of the go-around mode more conspicuous to the crew, including an aural alert.
3. To the FAA: Require air carriers to implement training programs related to recognizing inadvertent activation of go-around mode.

⁴²¹ Atlas-Polar-Southern FOTM, Bulletin 77, at 4–6 (2019) (attached as Exhibit 2).

⁴²² *Id.* at 6.

4. To the FAA: Implement Congress's 2010 mandate to establish an electronic database for pilot records.⁴²³
5. Reiterate, to the FAA: Develop a process for verifying, validating, auditing, and amending pilot training records at 14 *Code of Federal Regulations* Part 121, 135, and 91K operators to guarantee the accuracy and completeness of the records. (A-10-20).⁴²⁴

⁴²³ See Airline Safety and Federal Aviation Administration Extension Act of 2010, Pub. L. No. 111-216 § 203, 124 Stat. 2348, 2352 (to be codified at 49 U.S.C. § 44703) (2010).

⁴²⁴ NTSB, Accident Report NTSB/AAR-10/01, PB2010-910401, *Loss of Control on Approach, Colgan Air, Inc.* 171 (2010).

EXHIBIT 1



Pilot Selection Process

Human Resources Department

CONTENTS PRIVILEGED AND CONFIDENTIAL

Authority and Responsibility

Atlas Air (the Company) utilizes the following standard processes and procedures for interviewing and offering crewmember positions to pilot candidates. This document is incorporated in the Pilot Selection & Background Check Process which is a controlled document.

This document reflects the most current process information available. If new processes or procedures are implemented this document will be updated to reflect these changes.

The Company has made every effort possible to ensure the accuracy of the content herein. The Director, HR Flight Crew, is Responsible for the content and accuracy as well as ensuring content meets all regulatory requirements. The Sr. Vice President, Human Resources as the department head, is the Content and process Authority. If there are any questions, please contact:

**Sr. Vice President
Human Resources
Atlas Air Worldwide
2000 Westchester Ave.
Purchase, New York 10577
914-701-8000**

Equal Opportunity Employer

The Company is an Equal Opportunity Employer. It is our policy to afford equal employment opportunity to all employees and applicants for employment without regard to race, color, religion, sex, sexual orientation, national origin, citizenship, place of birth, age, disability, protected veteran status, gender identity or any other characteristic or status protected by applicable in accordance with Federal, State and Local laws.

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1 Pilot Qualifications

This manual is intended to describe the pilot selection process and provide guidance to persons conducting applicant assessments. This selection process is designed to thoroughly evaluate each pilot applicant and provide the Company with the information needed to make a hiring decision. This process covers all pilot hiring practices for Atlas Air / Polar Air & Southern Air Inc. The Company seeks to hire the most highly qualified aviation professionals. In order to be considered for a First Officer position, candidates must be technically competent and meet the below requirements.

1.1 Atlas Air / Polar Air Cargo (747 & 767 Fleets)

- Hold a current unrestricted ATP certificate with an airplane category multi-engine class rating and English proficiency endorsement
- Hold a current FAA First Class Medical Certificate
- Hold an FCC Restricted Radiotelephone Operator Permit
- Hold a valid passport with no restrictions on international travel
- Legally authorized to work in the United States
- Have a minimum of 1500 hours of total time
 - Military conversion of .3 per sortie
- Minimum of 500 hours of turbine time
- Minimum of 1000 fixed wing or 500 hours with a 121 carrier
- Minimum age of 23 (all Atlas pilot positions are subject to FAA 121 mandatory retirement regulations)
- Ability to pass a 10 year security background check and a DOT pre-employment test

1.2 Southern Air

1.2.1 737 Fleet

- Hold a current unrestricted or restricted ATP certificate with an airplane category multi-engine class rating and English proficiency endorsement
- Hold a current FAA First Class Medical Certificate
- Hold an FCC Restricted Radiotelephone Operator Permit
- Hold a valid passport with no restrictions on international travel
- Legally authorized to work in the United States
- Have a minimum of 1000 hours of total time
 - Military conversion of .3 per sortie
- Minimum of 1000 fixed wing or 500 hours with a 121 carrier
- Minimum age of 23 (all Southern pilot positions are subject to FAA 121 mandatory retirement regulations)
- Ability to pass a 10 year security background check and a DOT pre-employment test

1.2.2 777 Fleet

- Hold a current unrestricted ATP certificate with an airplane category multi-engine class rating and English proficiency endorsement
- Hold a current FAA First Class Medical Certificate
- Hold an FCC Restricted Radiotelephone Operator Permit
- Hold a valid passport with no restrictions on international travel
- Legally authorized to work in the United States
- Have a minimum of 1500 hours of total time
 - Military conversion of .3 per sortie
- Minimum of 500 hours of turbine time
- Minimum of 1000 fixed wing or 500 hours with a 121 carrier
- Minimum age of 23 (all Southern pilot positions are subject to FAA 121 mandatory retirement regulations)
- Ability to pass a 10 year security background check and a DOT pre-employment test

NOTE: ATP Certificates issued with a CIRC APCH-VMC Only limitation is acceptable

NOTE: All candidates offered a position as a First Officer will be tested in accordance with 14 CFR Part 120.107(5) Sub Part E

2 Hiring Process and Application Procedure

Resumes are received for review via the Company's Applicant Tracking System (ATS). Applicants apply for positions utilizing the Company's website. The Company recruits pilots through various means, including internal recommendations, industry career events and job boards. The Company strives to attract a diverse, qualified and experienced applicant pool. The ATS includes several layers of systematic required input that ensures applicants verify they meet all First Officer minimum qualifications and collects other input such as types of aircraft flown and total time. The Company uses this information to prioritize applications to be moved forward in the screening process. HR representatives review resumes for items such as total time, type ratings and work history. If a candidate is chosen to move forward in the application process they are contacted for a phone screen with an HR representative.

2.1 Phase 1 – Phone Screen

Candidates are contacted for phone screening by HR representatives. Phone screens allow HR representatives to ask more in-depth questions about a candidate's qualifications and employment

history. HR representatives provide an overview of the position, perform an employment history review, qualifications review and ask candidates a pre-determined list of required questions. The questions include termination history, training history, accidents / incidents, FAA violations, the candidate's ability to pass a TSA background check and if the candidate has any restrictions on international travel.

Phone screen results are held in the ATS and are used as reference during the overall candidate assessment process. A successful phone screen generally consists of candidates that appear to be a good fit for the position and have a limited training and accident / incident / violation history. HR representatives will often consult a member of Flight Operations management regarding candidate qualifications or for clarification of a technical question regarding a candidate. Flight Operations can decline to move a candidate forward in the process. Candidates that have a successful phone screen are invited to an in person interview.

2.2 Phase 2 – In-person Interview

During the in-person interview session the candidate will:

- Attend a presentation on the Company and perspective position
- Encouraged to ask questions about the perspective position, Company, and general lifestyle
- Complete a Technical Interview and Personnel Panel interview session

Personnel Panel

- Conducted by HR and Flight Operations (two or three people each)
- Reviews candidates 10 year employment history including termination history
- Interpersonal skills
- Communication skills
- Crew Resource Management Skills / Assertiveness
- Training history, accidents / incidents / FAA violations, letter of investigation and revocations and restrictions on international travel
- Failure to complete training programs or upgrade training for voluntary or involuntary reasons
- ICAO level 4 English Proficiency

Technical Interview

- Conducted by a current or former qualified crewmember
- Technical aviation knowledge
 - Weather
 - Performance
 - Airport procedures/markings

- Operations – International/overwater
- Decision Making / Assertiveness
- General trainability & ability to complete the Company's training program.
- Logbook review

2.3 Phase 3 – Ranking and Candidate Measuring

Following each interview day, all those involved in the process, meet to discuss the merits and ranking of each candidate. Rank is based on the following criteria:

- Highly Recommend
 - Candidate showed excellent skills in all areas
- Recommend
 - Candidate showed satisfactory skills in all areas
- Do Not Recommend
 - Candidate showed unsatisfactory skills in all areas

The interview ranking sheet for each candidate is kept on-file for two (3) years. Statistics of all candidates – those who are successful and those who are not, are kept on file as well. Statistics include:

- Total Flight Time (TT) of all candidates (successful and not)
- Percentage (%) of successful candidates in the interview process
- Percentage (%) of hires vs. Company requirements

2.4 Job Offer

Based on performance during all stages of the selection process, the most qualified candidates are offered employment or placed on a preferential hiring list for future pilot training classes. The final decision to offer a pilot position to a candidate is a joint decision between Flight Operations management and Human Resources. Flight Operations reserves the right to decline any candidate based on technical reasons.

All candidates are told of the interview outcome within two (2) weeks. Job offers are verbal followed by a written offer letter that is electronically signed; unsuccessful candidates are notified via email. As part of the job offer, the candidate must present information and complete the regulatory & Company screening process. This consists of:

- Pilot Records Improvement Act (PRIA)
- 10 year employment and criminal background check
- TSA criminal review of disqualifying offenses
- Alien Flight Student Program (AFSP) for non-US citizens
- Social Security Review

- DOT Drug Test History
- DOT pre-employment drug test

The Company utilizes third party vendors to facilitate each of the required checks.

2.4.1 PRIA / Pilot Record Improvement Act

Candidate must complete all required PRIA forms which includes records requests for all 121, 135, and Part 91 operators the candidate was employed as a crewmember during the last five (5) years.

PRIA includes: FAA issued licenses, medical certificates, accidents/ incidents, drug & alcohol testing history, disciplinary action that has not been overturned, all information regarding a pilots' separation from employment and national driver's registry check.

The HR rep reviews all PRIA forms and audits forms against application for employment and submits the reviewed forms to the background check vendor. The background check vendor begins all required checks and notifies the HR designated team if any discrepancies such as training failures or criminal records are returned. The vendor notifies the company as the discrepancies are reported and does not wait until the entire background review is complete to ensure the issue is dealt with in a timely manner.

PRIA discrepancies are reviewed by HR and Flight Ops and if necessary the candidate or new hire in question is interviewed and a final decision to move forward with the candidate is made. Discrepancies found during the background check process that were not originally revealed during the interview process must be signed off on by both HR and Flight Ops and documented. Based on PRIA results the Company representative has discretion to either continue the training process or rescind an offer of employment.

If no discrepancies are found during processing, the final PRIA report is reviewed by an HR& Flight Operations representative.

The Flight Operations representative sends training records a final PRIA review confirmation that is included in the pilot's release to operating experience records check and this is verified by Training Records prior to the pilot release to operating as a crewmember (initial operating experience)

NOTE: The Company currently utilizes Truview as the third party vendor for PRIA checks

NOTE: The Company does not currently utilize the Pilot Records Database (PRD) for background checks

2.4.2 10 Year Background Check

Candidate is submitted to a 10 year background check. This is conducted by a third party vendor. Background check looks at employment history, gap review, and criminal history. If there are no discrepancies the candidate continues as planned.

If a discrepancy is noted, the Company is contacted with further details. The employment decision is then left up to the Company representative's discretion. The same review process as PRIA occurs in terms of discrepancy management and final sign off of candidates or new hires.

NOTE: The Company currently utilizes Truview as the third party vendor for background checks

2.4.3 DOT Pre-employment Drug Test

Candidates offered safety-sensitive positions must submit to a DOT pre-employment drug test and receive a negative result prior to beginning employment. The Company is a Drug Free Workplace. The DOT drug test screens for the following substances:

- Marijuana
- Cocaine
- Opiates/ Opioids
- Amphetamines
- Phencyclidine (PCP)
- MDMA / Ecstasy

NOTE: The Company currently utilizes LabCorp/ Quest Diagnostics for all testing

3 Controls

The Human Resources department and Flight Operations conduct pilot hiring in accordance with this document:

- 1) Any deviations or changes must be coordinated and agreed upon between the two departments. Any proposed changes will trigger the SRA process.
- 2) Safety and Regulatory Compliance will audit this process and its data as part of its scheduled audit activities. Audit reports will go to the SVP HR and the SVP Flight Operations

4- Interfaces

The two (2) main stakeholders in the Pilot Selection process are Human Resources, Flight Operations.

SRC audits the process.

The Pilot Selection Process defines lines of authority and communication amount the two departments, consistency of procedures, and clearly delineates lines of responsibility. Human Resources designs, manages, and executes the hiring process.

Flight Operations sets appropriate qualifications per FAA and FOM guidance, participates in the hiring process, makes the final decision to hire, and conducts initial training of all new-hires.

EXHIBIT 2

From: Senior Directors, Flight Operations and Director, Operations
To: All Manual Holders
Issue Date: 16 JUL 19
Effective Date: 16 JUL 19
Expiration Date: 16 JUL 20
Subject: General Training Updates 2019

The following changes will be incorporated into a future revision of this manual:

***Title Page** - Modify the Authority and Responsibility statement as follows:

Authority and Responsibility

The Senior Directors, Flight Operations, as the Content Authorities, are jointly responsible for the accuracy of all content, as well as ensuring content meets with all regulatory requirements. The Senior Director, Flight Procedures, Training and Standards is responsible for the creation of the manual content.

***Page INTRO.3** - Modify the section "Revisions and Changes", and add the "Flight Operations Review" section, as follows:

Revisions and Changes

The manual is periodically revised to incorporate pertinent training information. Training items of a more critical nature will be incorporated in training bulletins and distributed in a timely manner.

The Senior Director, Flight Procedures, Training and Standards shall ensure formal and regular communication occur between and among flight operations management, instructors, evaluators, line check pilots, and flight crewmembers to achieve continuous improvement of ground, simulator, and aircraft training and line operations.

The Senior Director, Flight Operations is responsible for all training and qualification matters for Atlas, Polar, and Southern respectively. The Senior Director, Flight Operations delegates authority to the Senior Director, Flight Procedures, Training and Standards for day-to-day administration of the training and qualification program, program operations, and FOTM manual content, quality, additions, and revisions. The Senior Director, Flight Procedures, Training and Standards exercises this authority in coordination with the Fleet Captains, Training Center personnel, and the FAA Principal Operations Inspector, and/or APM.

Any questions about the content or use of this manual can be directed to:

Senior Director, Flight Procedures, Training and Standards, Atlas Air Training Center PO Box 669002 Miami Springs, Florida 33266

E-mail: fotm@atlasair.com

Flight Operations Review

The Flight Operations Review process is used for all changes in policy, procedure, and documents within Flight Operations; this includes changes outlined in the Training Program Modifications, Updates and Improvements section, above, and the Revisions and Changes outlined in this paragraph. The Flight Operations Review process interacts with and enhances the checks and restraints outlined in the Controls section, below.

As an integral part of the Flight Operations Review process, risk assessments are conducted to identify hazards associated with proposed changes in policy, procedures, or documents. The hazards are then analyzed using the Company's Risk Assessment Matrix, which will aid in identifying the appropriate action to be taken. Topic-based change management is used when possible to enhance the interface and standardization between Company documents, guidance, and training materials.

For more information on the current risk assessment process, See Safety Risk Assessment Procedures in the Safety Regulatory Compliance Manual.

***Page 1.1.7** - Modify the section "Logging FSTD Discrepancies" as follows:

Logging FSTD Discrepancies [§Part 60.20]

Each instructor, check pilot, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, must write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.

All corrections to discrepancies must be recorded when the corrections are made, and must include the date of correction; and a record of the discrepancy must be maintained for at least 60 days.

***Page 1.8.1** - Modify the section "Failed Checks And Incomplete Training" as follows:

FAILED CHECKS AND INCOMPLETE TRAINING

Notification

The Fleet Captain shall notify the POI and the Director of Operations in a timely manner of all failures.

Flight Crewmembers Who Fail a Proficiency Check or Line Check

A flight crewmember that fails any Proficiency Check or Line Check will immediately be removed from the line and assigned Remedial Training prior to attempting the qualification event again. See Remedial Training on page 1.1.5. The Remedial Training and subsequent PC will be conducted as follows:

NOTE

The Instructor or Check Pilot conducting remedial training must certify to the flight crewmember's proficiency before the flight crewmember attempts a qualification event again. This certification is not limited to the events the flight crewmember failed but it encompasses requirements of the qualification event.

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Failed Proficiency Check

Remediation is required on Unsatisfactory items. All Unsatisfactory items must be trained to proficiency. The Instructor/Check Pilot must evaluate that the flight crewmember is proficient to Satisfactorily complete a PC; this evaluation will not be limited to the items that were failed. A recommendation for the PC must be given. Upon remediation and recommendation a PC (with no warm up) will be administered with no waivers/signoffs. i.e. Requalification PC.

Failed Type Rating

Remediation is required on Unsatisfactory items. All Unsatisfactory items must be trained to proficiency. The Instructor/Check Pilot must evaluate that the flight crewmember is proficient to Satisfactorily complete a Type Rating; this evaluation will not be limited to the items that were failed. A recommendation for the Type Rating must be given. Upon remediation and recommendation a Type Rating will be administered on the items that were failed and may encompass some or all of the items required for the Type Rating.

Failed Line Check

The Fleet Captain will assign remedial training, which is dependent on items deemed unsatisfactory on the Line Check. This may range from ground school to simulator training or both. A PC may be directed by the Fleet Captain based on items unsatisfactory during the Line Check. A flight crewmember who fails an Annual Line Check must pass a Proficiency Check prior to attempting the Line Check again.

Once remedial training and, if applicable, the PC is complete, the flight crewmember will be assigned flying with a LCP. The LCP will observe the flight and make a recommendation when the crewmember is proficient enough to satisfactorily complete a line check.. Failure to be recommended for a Line Check in 2 consecutive flights results in a Training Review Board (TRB), see below.

Oral - Unsatisfactory

A grade of unsatisfactory on an oral (recurrent, initial, transition, or upgrade) will result in the flight crewmember not being allowed to progress to the qualification event until the flight crewmember receives remedial training in the deficient areas. Upon satisfactory completion the flight crewmember will retake the oral. A flight crewmember who fails to satisfactorily complete an oral associated with a PC will be considered to have failed the PC, and the provisions in the paragraph Flight Crewmembers Who Fail a Proficiency Check or Line Check, above, shall apply.

Recurrent Flight Training - Incomplete

A grade of incomplete due to proficiency on Recurrent Flight Training (RFT) will result in Remedial Training to address identified deficiencies, as directed by the Fleet Captain.

The Remedial Training will be conducted as follows: Remediation required on Incomplete items. Items not initially observed during the RFT must be flown to proficiency. Upon remediation of incomplete items the RFT is considered complete. At the discretion of the Fleet Captain, upon completion of the remediation a PC (with no warm up) will be administered with no waivers/signoffs. i.e. Requalification PC.

Flight Crewmembers Who Require Additional Training While in Upgrade, Transition, or Initial Training

Flight crewmembers must remain within the defined curricula segments of the training program and as such flight crewmembers will only be allowed additional training as provided by the CBA.

Flight crewmembers making unsatisfactory progress during a training curriculum and/or are not recommended to progress to the next segment of training or checking event will be given remedial training. Items found deficient will be addressed during remedial training. The Instructor must evaluate that the flight crewmember is proficient to Satisfactorily progress to the next segment of training and the evaluation will not be limited to the items that were found to be deficient.

Self withdraw from any curricula will be considered a failure of that curricula. Exceptions will be given to circumstances beyond the flight crewmembers control (e.g., death in family).

Training Review Board (TRB)

The Training Review Board (TRB) is convened when a flight crewmember has reached the limit of additional training or checking allowed in the CBA; or at the discretion of the Fleet Captain for a new-hire crewmember or crewmember still on probation. In either case, the Company may remove a Crewmember from the training curriculum after providing the additional training. Upon removal, a Crewmember will be returned to his last Position after completing any required re-qualification training curriculum. For a new-hire crewmember or crewmember still on probation the disposition of the flight crewmember's employment status will be at the discretion of the Company.

TRB Composition

The TRB will be comprised of:

- Sr. Director Flight Procedures, Training and Standards
- Fleet Captain
- Chief Pilot

TRB Guidelines

The TRB may make the following decisions:

- Additional remediation
 - Requires only a simple majority
- Removal from the training program
 - Requires a unanimous decision, or in the event of an other than unanimous decision, the Senior VP of Flight Operations will make the final decision.

***Page 1.8.2** - Modify the section "PWP Entry" as follows:

PWP Entry

Entry into the proficiency watch program will comprise any of the following within a two (2) year rolling period:

- A flight crewmember who demonstrates multiple incompletes/failures of a Recurrent Flight Training (RFT), Proficiency Check, or Line Check (LC) or combination thereof. The following is an example:
 - A crewmember incompletes an RFT, is retrained, completes the RFT and then subsequently receives an unsatisfactory grade on a PC or LC.
 - A crewmember receives an unsatisfactory grade on a PC, is retrained, completes the PC and then subsequently receives an unsatisfactory grade on the next scheduled PC or LC.
- A flight crewmember who demonstrates a performance deficiency in a training curriculum and subsequently receives an unsatisfactory grade on a Type, PC, or LC. The following is an example:
 - A crewmember demonstrates the need for remedial training due to a performance deficiency on a maneuver/procedure/subject area (e.g. Non-ILS approaches) during a training curriculum (e.g. Initial, Upgrade, Transition, or Requalification) and subsequently receives an unsatisfactory grade on the same task on the Type Rating, PC, or LC.
- A flight crewmember who repeatedly demonstrates a performance deficiency on a maneuver/procedure/subject area during training or checking (PC, RFT, or LC). This may include failure of a specific maneuver/ procedure/subject area (e.g. Non-ILS approaches) for which the pilot receives additional training in accordance with § 121.441(e) during a proficiency check even if the pilot resumes the proficiency check and passes that maneuver/ procedure/subject area and all other maneuvers/procedures/subject areas during that proficiency check. The following is an example:
 - A crewmember who is deemed incomplete, unsatisfactory, or is required to repeat a maneuver/procedure/subject area (e.g. Non-ILS approach) as part of a PC (or RFT or LC) and accomplishes the PC (or RFT or LC) satisfactorily and then during the next subsequent training/checking event (PC, RFT, or LC), the identical maneuver, procedure, or subject area is deemed to be incomplete, unsatisfactory, or is required to be repeated (PC).
- A flight crewmember who demonstrates a repetitive need for remedial training within a training curriculum; this remedial training could be due to (but is not limited to) a repetitive need for either of the following, or a combination of both:
 - A crewmember making unsatisfactory progress during a training curriculum, and/or
 - A crewmember not recommended to progress to the next segment of training or checking event.

***Page 1.8.3** - Modify the section "PWP Structure" as follows:

PWP Structure

A PWP record will be prepared upon PWP entry. The record must include the specific maneuvers/ procedures/subject areas in which the flight crewmember has demonstrated performance deficiencies. This record will be maintained by Training Records and made available to the instructors/check pilots conducting the PWP RFT, PWP PCWU/PC, and PWP line check outlined below. The instructors/check pilots should strive to include training on deficient areas during each event.

In order to satisfactory complete the PWP PC, the flight crewmember must demonstrate mastery of the maneuvers/procedures/subject areas indicated on the PWP record.

- 3 months after the return to active flying status, the flight crewmember will return for a RFT.
- 6 months after return to active flying status, the flight crewmember will return for a PCWU and PC

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- Within the duration of the PWP, a two (2) leg line check will be conducted on the flight crewmember. One leg as PF and one as PM.
- A flight crewmember who successfully accomplishes all events of the PWP, and demonstrates mastery of previously deficient maneuvers/procedures/subject areas, will be released from the PWP.
- A flight crewmember who fails any event while in the PWP will be considered to have failed to exit the program and will be reentered into the PWP.

***Page 1.13.3** - Add the new section "Pilot Records Improvement Act (PRIA)":

Pilot Records Improvement Act (PRIA) Policy

All New-Hire flight crewmember candidates must complete all required PRIA forms which includes records requests from all part 121, 135, and 91 operators the candidate was employed with as a crewmember during the last five (5) years. PRIA also includes a review of FAA issued licenses, medical certificates, accidents/ incidents, drug & alcohol testing history, and national driver's registry check.

PRIA Workflow

The PRIA workflow is overseen by a Human Resources representative (HR rep) and uses a designated agent to conduct the required background checks.

The HR rep reviews all PRIA forms and audit forms against application for employment and submits the reviewed forms to the designated background check agent. The background check agent begins all required checks.

No Discrepancies Found

If no discrepancies are found during processing, the PRIA report is reviewed by an HR representative after the entire background check is complete. After the HR review, a Flight Ops representative also reviews the PRIA no later than completion of Initial Training and prior to release to Operating Experience (OE). The Flight Operations representative sends training records a final PRIA review confirmation that is included in the pilot Release to OE records check.

Discrepancies Found

If any discrepancies such as training failures or criminal records are found, the designated background check agent notifies the Company as soon as this discrepancy information is received by the designated agent; the designated agent does not wait until the entire background check is completed. This email is received by multiple HR team members. HR then reviews the applicant's employment applications, phone screen, and interview notes to determine if the discrepancy was revealed during the interview process. HR consults the applicant directly to allow for explanation and invites a member of Flight Operations Management to participate in the conversation with the applicant. HR and Flight Operations jointly decide to move forward or discontinue the candidate in this process. Discrepancies not revealed during the hiring process are signed off on by both HR and Flight Ops and the sign off documented in the background check if the candidate is chosen to continue in the hiring process.

***Page 2.1.17** - Change "Note 7" of "Reduced Initial New-Hire - 747" to read:

⁷Reduced Initial Aircraft Systems total hours reduced to 39:00.

*Page 2.1.33 – Modify Table 2.1.21. “Recurrent Training – Common” as follows:

RECURRENT TRAINING - COM

Table 2.1.21. Recurrent - Common

RECURRENT - COMMON	
TRAINING SEGMENT NAME	MODULES / HOURS
Ground Training ¹	
• <i>Hazardous Materials</i> - COM on page 3.1.2 [121 Appendix O and Subpart Z]	RHZ / As req. ²
• <i>Aircraft Operator Security</i> - COM on page 3.1.4 [49CFR Part 1544] [AOSSP]	ROS / 02:00
• <i>Crew Resource Management</i> - COM on page 3.1.4 [§121.427(b)]	RCR / 04:00
• <i>General Emergency Training</i> - COM on page 3.1.3 [§121.417, §121.427(b)]	RET / 03:00 ³
• <i>General Operational Subjects</i> - COM on page 3.1.5 [§121.427(b)]	RGS / 10:00
• <i>Aircraft Systems - Recurrent/Refresher</i> on page 3.1.13 [§121.427(b)]	(RS3, RS4, RS6, or RS7) / 10:00
<i>Recurrent/Consolidation</i> - COM on page 3.1.29 [§121.427(d)]	FFSR / 08:00 ⁴
<i>Flight Training - UPRT</i> - COM on page 3.1.30 [§121.423]	RUP / As req. ⁵
Program Hours	37:30 ⁶

RECURRENT - COMMON	
QUALIFICATION SEGMENTS (B) - COM ON PAGE 3.1.41	MODULE / HOURS
Proficiency Check ⁷ [§121.409(b), §121.441]	FFSQ.1 / As req.
Line Check ⁸ [§121.440]	LC.1 / As req.

¹ Segments listed under Ground Training may be accomplished whole or in part via Distant Learning. Program hours for §121.427(b) segments must not be less than 25:00 hours.

² Refer to the Dangerous Goods Manual (DGM) for Hazmat/DG recurrent training requirements.

³ Emergency drill requirements are accomplished once each 24 calendar months during recurrent training per §121.417 (c)(2).

⁴ Includes 4:00 hours of required RFT or RLOFT, and 4:00 hours of PCWU (PCWU not required if all tasks are accomplished in the PC).

⁵ RUP required once every 24 calendar months.

⁶ 00:30 hours of UPRT ground training included in this total, to be accomplished in RUP pre-brief.

⁷ The Proficiency Check will not be completed when the flight crewmember is due Recurrent Flight Training.

⁸ Captain only. For more information, refer to GlobalNet for current manual revisions. Printed or downloaded copies are considered uncontrolled and are for reference only.

*Page 3.1.15 - Modify table 3.1.15 as follows:

Table 3.1.15. RS4 - 747 - Cycle B - Even Years

RS4 - 747 - CYCLE B - EVEN YEARS	
MODULE NAME AND PAGE #	HOURS
RS4.11 Airplane General and Limitations on page 4.1.50	
RS4.12 Air Systems on page 4.1.50	
RS4.13 Fire and Overheat Protection on page 4.1.50	
RS4.14 Fuel System on page 4.1.50	
RS4.15 Navigation, Autoflight, Flight Instruments on page 4.1.50	
RS4.16 Warning Systems on page 4.1.51	
RS4.17 Differences Summary on page 4.1.51	
RS4.18 Communications Systems & CPDLC Exercise on page 4.1.51	
RS4.19 Systems Review and Examination on page 4.1.51	
Total Hours	10:00

*Page 4.1.51 - Update the following list as follows:

RS4.17 Differences Summary

RS4.18 Communications Systems & CPDLC Exercise

RS4.19 Systems Review and Examination

*Page A.1.1 - Remove the definitions "Airplane Flight Training Device," "Level 4," "Level 5," and "Level 6," and replace with the definition "Flight Training Device (FTD)" with sub-definitions, as follows:

Flight Training Device (FTD)

Flight training device (FTD) means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in regulatory guidance (part 60) and the qualification performance standard (QPS) for a specific FTD qualification level.

Before any level 4 or 5 FTD can be used, it must be evaluated by the POI to determine that it meets the prescribed requirements for the appropriate level of FTD. Before a level 6 or higher FTD or any level FFS can be used, it must be evaluated and qualified by the National Simulator Program (NSP) and approved by the operator's POI.

Level 4

Permits learning, development, and the practice of skills and cockpit procedures necessary for understanding and operating the integrated systems of a specific aircraft.

Please refer to GlobalNet for current manual revisions. Printed or downloaded copies are considered uncontrolled and are for reference only.

Level 5

Permits learning, development, and the practice of skills, cockpit procedures, and instrument flight procedures necessary for understanding and operating the integrated systems of a specific aircraft in typical flight operations in real time.

Level 6

Permits learning, development, and the practice of skills in cockpit procedures, instrument flight procedures, certain symmetrical maneuvers, and flight characteristics necessary for operating the integrated systems of a specific aircraft in typical flight operations.

Level 7

Permits learning, development, and the practice of skills in flight deck procedures, instrument flight procedures, certain symmetrical maneuvers, and flight characteristics necessary for operating the integrated systems of a specific aircraft in typical flight operations. A level 7 FTD is intended to be used to introduce training tasks and not necessarily to be used for training to proficiency or checking/testing. Events labeled with a "T" in the respective chart (see 8900.1 Vol 3 Ch 19 Sect 6) require additional training either in an aircraft or in a FFS, and may not be used to evaluate proficiency or to check or test.

***Page A.1.2** - Remove the definitions "Airplane Full Flight Simulator," "Level C," and "Level D," and replace with the definition "Full Flight Simulator (FFS)" with sub-definitions, updated as follows:

Full Flight Simulator (FFS)

An airplane Full Flight Simulator (FFS) is a full size replica of a specific type or make, model, and series airplane cockpit, including the assemblage of equipment and computer software programs necessary to represent the airplane in ground and flight operations, a visual system providing an out-of-the-cockpit view, a force (motion) cueing system which provides cues at least equivalent to that of a three degree of freedom motion system, and has the full range of capabilities of the systems installed in the device as described in regulatory guidance (part 60) and the qualification performance standards (QPS) for a specific FFS qualification level.

Level C

To permit development and practice of the necessary skills for accomplishing flight operational tasks, to a prescribed standard of airman competency in a specific aircraft and position. Level C FFSs may be used for pilot recency of experience requirements and for specified flight operational task training in transition, upgrade, recurrent, and re-qualification training under Part 121. It may also be used for Initial New-Hire and Initial Equipment training for all events. All training events may be conducted in a Level C flight simulator for persons who have previously qualified as PIC or SIC with the Company.

Level D

To permit development and practice of the necessary skills for accomplishing flight operational tasks, to a prescribed standard of airman competency, in a specific aircraft and position. Level D flight simulators may be used for Part 121 pilot currency and for all flight operational task training.

Additional Requirements

In accordance with part 60, beginning March 12, 2019, a level C or level D FFS must be specifically qualified to conduct the training or checking of the following maneuvers:

- Upset recovery
- Instructor-guided, hands-on experience of recovery from full stall, and, if equipped, stick pusher activation
- Recovery from bounced landing
- Crosswind takeoff with gust
- Crosswind landing with gust
- Demonstrations of the effects of engine and airframe ice accretion

***Page A.1.4** - Add the definition "Flight Simulation Training Device (FSTD)":

Flight Simulation Training Device (FSTD)

Flight training equipment consists of flight training devices (FTD), Full Flight Simulators (FFS), and the aircraft. The approved use of each item of flight training equipment is listed in the maneuvers and procedures tables (see 8900.1 Vol 3 Ch 19 Sect 6). These FTDs and FFSs are the only types of flight training equipment (other than aircraft) which may be approved for use in an FAA-approved flight training program.

As flight equipment is updated, training equipment must be modified to ensure that it maintains the performance and function of the aircraft type or aircraft equipment that it replicates.

***Page A.1.4** - Update the definition "Ground Training Devices" as follows:

Ground Training Devices

Devices ranging from simple paper pictorial displays to static aircraft. They may include instructor presentations, computer based instruction, aircraft system panels, models, mock-ups, FTD, FFS, and numerous other instructional delivery methods.

As flight equipment is updated, training equipment must be modified to ensure that it maintains the performance and function of the aircraft type or aircraft equipment that it replicates.

***Page A.1.4** - Add the definition "Initial Training":

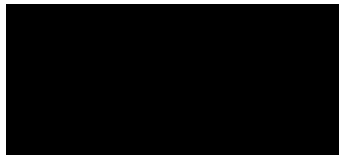
Initial Training

The term Initial training includes all Initial training programs: Initial New-Hire, Initial Equipment, and Reduced Initial New-Hire.

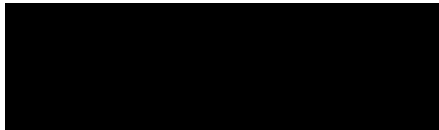
***Page A.1.5** - Replace the definition "Systems Integration Training (SIT)" with the following:

Systems Integration Training (SIT)

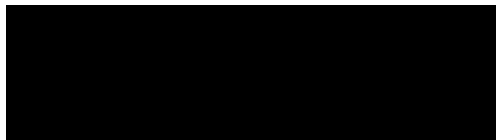
Training on how aircraft systems interrelate with respect to normal, non-normal, and emergency procedures. This training includes procedures as basic as those for powering the aircraft electrical and pneumatic systems with the APU or as complex as those for programming computerized navigation and autoflight systems. System integration training should include flight crewmember interaction in the use of checklists, CRM, and other operational procedures. It is normally conducted using FTDs portraying a specific flight deck layout, including the switch and indicator/annunciator logic. SIT may also be conducted in an FFS. Additionally, Distance Learning or other interactive systems may be used for this training. System Integration Training may be conducted in conjunction with aircraft systems training or as a later phase of the aircraft ground training curriculum segment. For Recurrent ground training, SIT is accomplished during the Proficiency Check Warm-up.



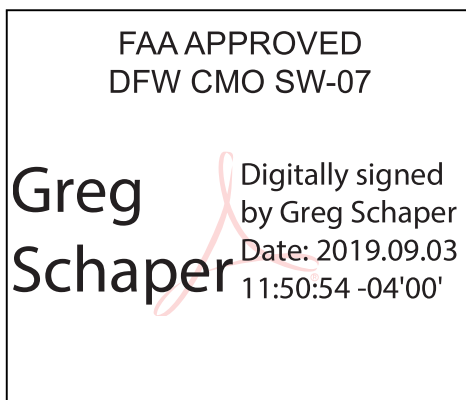
James S. Ridgway
Senior Director, Flight Operations
Atlas Air, Inc.



Chris Agnini
Senior Director, Flight Operations
Polar Air Cargo Worldwide, Inc.



Steve Turner
Director, Operations
Southern Air, Inc.



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EXHIBIT 3

Deidentified Flight Crew Event Report 720

Overview:

Title: Sep 2015 - NAP Go-Around

Processing:

ID: 720

Title: Sep 2015 - NAP Go-Around

Date/Time When Event Occurred: Sep 2015

Viewer Accessible: Yes

Event: 1

Baseline Risk Assessment

Likelihood:	B – Possible
Severity:	II – Critical
Risk Factor:	High

Description

ATC Information:

Name of ATC Facility: Naples Tower

Aircraft Configuration:

Aircraft Type: B767-300ER

Seat Belt Sign: On

Speed IAS (Knots): 140

Flight Crew Employee Information:

Duty Off Time: Sep 2015

Duty On Time: Sep 2015

Primary Duties During Time of Event: Pilot Flying

Flight Event Classification:

Go Around: Yes

Flight Information:

Departure Airport, Runway and Gate: LERT/ROZ - 10/28

Passengers On Board: Yes

Revenue Flight: Part 121

Time of Day: Daylight

Scheduled Arrival Airport, Runway and Gate: LIRN/NAP - 06/24

Landing Airport, Runway and Gate: LIRN/NAP - 06/24

Geographic Location:

Airport: LIRN/NAP

Narrative:

FLT ID 1254 - First Officer - Pilot Flying

On final approach, at about 300' AGL, pilot reporting was flying with autopilot off, but auto-throttle on. Pilot was in position to land and attempted to disconnect auto-throttle. Pilot probably inadvertently pushed the go-around switch instead of the auto-throttle disconnect.

Pilot started to retard throttles, but realized it was too late and was not in a position to make a normal landing, so pilot chose to follow the go-around commands. Aircraft was vectored back to runway 24 for landing. A landing was accomplished on runway 24. The landing was a firm landing which caused two O2 masks to deploy. Pilot conferred with the Lead Mechanic on board. The lead mechanic advised that no hard landing limitations were exceeded. An after landing inspection of the aircraft was completed by FO and Lead Mechanic, with no problems noted by either.

Pilot flying has just under one year experience in the B-767, after having flown the B-747 Classic and -400 for several years. Pilot probably, inadvertently, reverted to previous experience in auto-throttle placement to disconnect the auto-throttle and inadvertently pressed the B-767 go-around switch.

FLT ID 1256 - First Officer - Pilot Monitoring/Pilot Not Flying
Captain inadvertently pushed the go-around button while trying to disconnect the auto-throttle. Go-Around mode was engaged and thrust was added. As a result we became high on the glide path on short final and in an unstable state to land the aircraft. A normal go-around was executed and after vectors from ATC, a normal approach to landing was completed.

Phase of Flight:**Flight Phase at Start of Event:** Approach**Weather:****Meteorological Conditions:** VMC**Weather Description:** CAVOK**Cause****Human Factors:****Equipment Placement:** Yes**Detection****Reaction****Flight Crew:****Executed Go Around:** Yes**Suggestions****Narrative:**

FLT ID 1256 - First Officer - Pilot Monitoring/Pilot Not Flying
Be more cognizant of what our body/muscle memory is doing. I believe on the 747, the auto-throttle disconnect buttons are where the go-around buttons are on the 767. Captain has many years of previous experience on the 747.

Report generated Thu, 23 Jan 2020 19:19 Z

EXHIBIT 4

Deidentified Flight Crew Event Report 1546

Overview:

Title: Jun 2017 - DFW Go-Around (TOGA)

Processing:

ID: 1546

Title: Jun 2017 - DFW Go-Around (TOGA)

Date/Time When Event Occurred: Jun 2017

Viewer Accessible: Yes

Event: 1

Baseline Risk Assessment

Likelihood:	B – Possible
Severity:	III – Serious
Risk Factor:	Moderate

Description

ATC Complications/Errors:

ATC Complications/Errors: Yes

Aircraft Configuration:

Aircraft Type: B767-300ER

Altitude Deviation:

Altitude Deviation: Yes

Amount of Altitude Deviation (Ft): 300

Flight Crew Employee Information:

Primary Duties During Time of Event: Pilot Flying

Flight Information:

Departure Airport, Runway and Gate: KCVG/CVG

Revenue Flight: Part 121

Scheduled Arrival Airport, Runway and Gate: KDFW/DFW

Landing Airport, Runway and Gate: KDFW/DFW

Narrative:

FLT ID 3736 - Captain - Pilot Flying

I was flying on one of my CA OE events. On ILS approach to 17C at DFW, I was

on glide path, configured, on speed, and cleared to land. I disconnected the au

topilot but when I attempted to disconnect the autothrottle I accidentally hit the

go around switch. I made the decision to go around. I was caught off guard by

the steep nose attitude and rapid climb commanded by the flight director. We ini

tiated the go around somewhere above 1000 feet and were only climbing to

3000. My go around execution was sloppy and we exceeded missed approach altitude by about 200-300 feet. I then corrected back to 3000. We executed an other approach and landing which were uneventful. As a training debrief item we discussed the fact that I could have simply disconnected the auto throttle and continued the approach since I was on profile. It was a good learning experience.

Phase of Flight:**Flight Phase at Start of Event:** Approach**Cause****Individual Factors:****Experience Level:** Yes**Detection****Reaction****Flight Status after Event:****Executed Go Around:** Yes**Suggestions**

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Report generated Thu, 23 Jan 2020 19:30 Z

EXHIBIT 5

Deidentified Flight Crew Event Report 3912

Overview:

Title: Aug 2019 - ADJ Go-Around Event (TOGA)

Processing:

ID: 3912

Title: Aug 2019 - ADJ Go-Around Event (TOGA)

Date/Time When Event Occurred: Aug 2019

Viewer Accessible: Yes

Event: 1

Baseline Risk Assessment

Likelihood:	C – Unlikely
Severity:	III – Serious
Risk Factor:	Minor

Description

Aircraft Configuration:

Aircraft Type: B767-300ER

Altitude (Ft) MSL: 200

Event Information:

Station Code: ADJ

Flight Information:

Departure Airport, Runway and Gate: EDFH/HHN - 03/21

Scheduled Arrival Airport, Runway and Gate: OJAM/ADJ - 06/24

Landing Airport, Runway and Gate: OJAM/ADJ - 06/24

Flight Status after Event:

Executed Go Around: Yes

Narrative:

FLT ID 7853 - Captain

(Captain #1, Name Removed) was the Pilot Monitoring, (First Officer #1, Name Removed) was the Pilot Monitoring. (Captain #2, Name Removed) and (First Officer #2, Name Removed) were present in the flight deck as well.

During approach to runway 24, wind conditions were much more gusty than reported. Around 200', a strong wind gust caused stabilized approach criteria to be exceeded and I called for a go around. The PF advanced the thrust levers and called for flaps 20. The gear was raised and I noticed a decreasing speed trend. I saw that the auto throttle was disconnected so I helped the PF advance the throttle more to maintain our speed. ATC began vectoring us for another approach and asked us to level off at 6000 feet. The PF was having a difficult time stabilizing the airplane, and I saw that "TOGA" had not engaged. So, I quickly reset the flight directors OFF then ON and selected LNAV and SPEED to give the PF useful information.

While hand flying and trying to intercept and maintain our assigned altitude, the we briefly exceeded the selected flap speed limit by about 5 knots. Things were happening very quickly and I felt the PF was getting overwhelmed as this was his first flight since completing OE so I assumed control of the airplane and called for flaps 5. We got the airplane stabilized and prepared for another approach to runway 24 with a proper gust factor added for the new wind conditions. During all of this, Captain [REDACTED] and First Officer [REDACTED] provided invaluable assistance with making call outs, setting up the approach, and communicating with the Flight Attendants and passengers. Once we were ready, we made an uneventful approach and landing. The added gust factor to our speed worked very well.

After landing, I debriefed (First Officer #1, Name Removed) and told him I believe he accidentally pressed the Autothrottle Disc. instead of the TOGA button. This was understandable given that was the location of the TOGA button on his previous airplane. We all explained our own techniques to help him establish good habits and muscle memory to prevent any similar problems in the future. All in all, while the go Around was not text book, I believe everyone in the flight deck worked very well together to maintain the safety of the flight. I also debriefed the Flight Attendants about their experience, and they told me it felt like a normal takeoff in bumpy conditions and nothing seemed out of the ordinary. A logbook entry for the flap over speed was also made.

FLT ID 7852 - First Officer

During our approach to ADJ we descended, slowed, and configured as outlined in the standard operating procedures without issue. We were fully configured and stable prior to the final approach fix and continued in a stable state until about 300' AFE. At this time we began to experience gusts which created airspeed fluctuations and updrafts. We called and initiated a go-around near 200' AFE. The proper calls and go-around procedure was followed with the exception of selecting the TOGA switches. Reaching 400', LNAV was commanded. At 1000' VNAV and center autopilot were commanded, however, this was where our error chain caught up with us and our go-around profile was off course from the standard operating procedure. Rather than having selected VNAV and CMD, we should have selected a maneuvering speed for a return to landing, retracted flaps, selected FLCH and then reengaged the autopilot when we reached our target airspeed. Caught off guard by the infrequency of a go-around, we had confusion about what the autopilot was doing as it began to pitch up and decelerate. I promptly disengaged the autopilot and reversed the airspeed trend by lowering the pitch while continuing our climb on the missed approach profile. The aircraft returned to the desired flight path and airspeed. We were instructed to climb on present heading to maintain 6000'. We engaged heading select on the MCP and re-engaged the autopilot. The aircraft continued it's climb and appeared that it was not going to stop at the selected altitude of 6000'. Once again I disengaged the autopilot and

manually leveled the aircraft. We were then given a right turn direct AMN VOR and encountered a patch of rough air while in the process of re-automating which caused us to descend about 200'. We recovered promptly and returned to our assigned altitude of 6000'. This go-around was the first for both the PM and myself outside of the sim environment. We mitigated automation and procedural errors through the use of hand flying, creating time, and expanding our CRM team to the relief crew in the jumpseats. Upon successful and stable automation we ran our checklists and set up for the ILS to return to the field for another approach. We reconfigured and flew a coupled approach with a normal landing without further incident.

Phase of Flight:

Flight Phase at Start of Event: Go Around

Weather:

Turbulence: Moderate

Cause

Detection

Reaction

Suggestions

Narrative:

FLT ID 7853 - Captain

This illustrates the importance of familiarizing yourself with a new crew and their background. It is important to weigh their experience level with their need to get experience to ensure a safe outcome of a flight.

FLT ID 7852 - First Officer

Going forward I believe that a better understanding of the go-around procedure would help alleviate the difficulty experienced by our crew. For all four of us, this was the first go-around outside of the sim environment. Reviewing the go-around procedure during our briefings on occasion can help prevent difficult and undesired situations from occurring during abnormal procedures such as this. For crews that may experience this in the future, proficiency in hand flying and a firm understanding of autopilot modes can help avoid a poor outcome. Debriefing with a jump seating crewmember provides an extra perspective that can be very valuable like it was for us and using them to expand the CRM team is invaluable during infrequent events such as go-arounds.

Corrective Action ID 1557

Status:		Closed	
Opened:	Mon, 09 Sep 2019	Assigned:	Thu, 05 Sep 2019
Due:	Thu, 19 Sep 2019	Closed:	Mon, 09 Sep 2019
Rejected:			
Department:		Employee: [REDACTED]	

(450930)

Action:**Response:**

Flagged.

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EXHIBIT 6

Deidentified Flight Crew Event Report 2316

Overview:

Title: May 2018 - DAY Go-Around Speed Deviation (250/10K)

Processing:

ID: 2316

Title: May 2018 - DAY Go-Around Speed Deviation (250/10K)

Date/Time When Event Occurred: May 2018

Viewer Accessible: Yes

Event: 1

Baseline Risk Assessment

Likelihood:	B – Possible
Severity:	III – Serious
Risk Factor:	Moderate

Description

ATC Information:

Name of ATC Facility: CVG approach

Aircraft Configuration:

Aircraft Type: B747-400

Fatigue Survey:

Consecutive Hours Awake Prior to Event: 8-16 hours

During What Hours did the Event Occur: 14:00-17:00

Hours of Sleep 3 Days Prior to Event: <15 hours

How Many Time Zones Crossed Preceding 14 days: 9-12

Flight Crew Employee Information:

Primary Duties During Time of Event: Pilot Flying

Flight Information:

Departure Airport, Runway and Gate: KLAX/LAX

Scheduled Arrival Airport, Runway and Gate: KDAY/DAY

Landing Airport, Runway and Gate: KDAY/DAY

Narrative:

FLT ID 5137 - Captain - Pilot Flying

Go-around on short final due to windshear/gusts. Had briefed opening the speed window if a go-around was required. A/P was engaged for the go-around, with gusty winds and moderate rain. I thought that I had opened the speed window to limit the airspeed. I believe, but am not sure, that I then inadvertantly pressed TO/GA again after this. Speed increased to exceed 250kts below 10,000. I though the speed deviation was due to windshear, but then later realized that the autothrottles were in THRust mode.

FLT ID 5136 - First Officer - Pilot Monitoring

Pulled the latest ATIS for CVG it reported VFR conditions. An

approach there was some thunderstorms moving towards the field. In the interest of safety the captain took the flight controls from me and continued the approach. After hitting some wind gusts and excessive cross winds both the captain and I called a go around with the autopilot engaged. On the go around ATC started giving multiple instructions such as headings altitudes and frequency changes. As the pilot monitoring I was busy getting it all taken care of while doing everything that was commanded by the captain such as configuration changes. On the go around the captain and I decided it was best to go to Dayton. During the go around after I selected flaps to up I was in the process of coordinating with ATC routing to Dayton (DAY) and I was a bit busy programming the FMS the captain was flying with the autopilot on. I looked up and realized the airspeed was approximated 290 knots at approximately 3000 feet and I mentioned to the captain that we need another vertical mode as he had not engaged one on the go around mostly due to the turbulence and high workload at that point. The airspeed was corrected and there was no further issues. There was no aural warnings of any overspeeds of the airplane at all.

Phase of Flight:

Flight Phase at Start of Event: Go Around

Speed Deviation:

Airspeed Below 10K: Yes

Weather:

Meteorological Conditions: IMC

Weather Description: TRW

Cause

Communication: Between Pilots:

Lack of Communication: Yes

Human Factors:

Automation-FMS or Autopilot Usage: Yes

Pilot Handling-Judgment Airmanship: Yes

Individual Factors:

Fatigue: Yes

Weather:

Thunderstorms: Moderate

Turbulence: Moderate

Wind: Moderate

Windshear: Moderate

Detection

How Event Detected:

Flight Crew: Yes

When Event Detected:

In-Flight: Yes

Reaction

Action Taken:**After-the-Fact:** Yes**Flight Crew:****Corrected Pitch/Power:** Yes**Executed Go Around:** Yes**Flight Status after Event:****Diversion-Filed Alternate:** Yes**Suggestions****Narrative:**

FLT ID 5137 - Captain - Pilot Flying

Need to actually look more at FMA's. Stronger briefing to PM to back me up on MCP speed intervention or to query me if it does not happen.

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Report generated Thu, 23 Jan 2020 19:34 Z