

**NATIONAL TRANSPORTATION SAFETY BOARD**  
**Virtual Meeting of July 14, 2020**  
**(Information subject to editing)**

**Rapid Descent and Crash into Water, Atlas Air Inc. Flight 3591**  
**Boeing 767-375BCF, N1217A**  
**Trinity Bay, Texas**  
**February 23, 2019**  
**DCA19MA086**

This is a synopsis from the NTSB's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

## **Executive Summary**

On February 23, 2019, at 1239 central standard time, Atlas Air Inc. (Atlas) flight 3591, a Boeing 767-375BCF, N1217A, was destroyed after it rapidly descended from an altitude of about 6,000 ft mean sea level (msl) and crashed into a shallow, muddy marsh area of Trinity Bay, Texas, about 41 miles east-southeast of George Bush Intercontinental/Houston Airport (IAH), Houston, Texas. The captain, first officer (FO), and a nonrevenue pilot riding in the jumpseat died. Atlas operated the airplane as a Title 14 *Code of Federal Regulations (CFR)* Part 121 domestic cargo flight for Amazon.com Services LLC, and an instrument flight rules flight plan was filed. The flight departed from Miami International Airport (MIA), Miami, Florida, about 1033 (1133 eastern standard time) and was destined for IAH.

The accident flight's departure from MIA, en route cruise, and initial descent toward IAH were uneventful. As the flight descended toward the airport, the flight crew extended the speedbrakes, lowered the slats, and began setting up the flight management computer for the approach. The FO was the pilot flying, the captain was the pilot monitoring, and the autopilot and autothrottle were engaged and remained engaged for the remainder of the flight.

Analysis of the available weather information determined that, about 1238:25, the airplane was beginning to penetrate the leading edge of a cold front, within which associated windshear and instrument meteorological conditions (as the flight continued) were likely. Flight data recorder data indicated that, during the time, aircraft load factors consistent with the airplane encountering light turbulence were recorded and, at 1238:31, the airplane's go-around mode was activated. At the time, the accident flight was about 40 miles from IAH and descending through about 6,300 ft msl toward the target altitude of 3,000 ft msl. This location and phase of flight were inconsistent with any scenario in which a pilot would intentionally select go-around mode, and neither pilot made a go-around callout to indicate intentional activation.

Within seconds of go-around mode activation, manual elevator control inputs overrode the autopilot and eventually forced the airplane into a steep dive from which the crew did not recover. Only 32 seconds elapsed between the go-around mode activation and the airplane's ground impact.

The investigation evaluated the following safety issues:

- **Inadvertent activation of the go-around mode.** The investigation determined a likely scenario to explain how the go-around mode became activated. However, a review of the available data suggests that inadvertent activation of the go-around mode on Boeing 767-series airplanes may be a rare and typically benign event.
- **Flight crew performance.** The investigation examined the factors that influenced the FO's incorrect response following the unexpected mode change and the captain's delayed awareness of and ineffective response to the situation.
- **Atlas' evaluation of the FO.** The FO failed to disclose to Atlas some of the training difficulties he experienced at former employers, and Atlas' records review did not identify the FO's past training failure at one former employer, which may have affected how Atlas evaluated him during the hiring process and during training.
- **Industry pilot hiring process deficiencies.** Limitations in the background records retrieval process places hiring operators (like Atlas when considering the FO's application) at a disadvantage when trying to obtain a complete training history on a pilot applicant. Also, the circumstances of this accident highlighted a need for improved pilot selection and performance measurement methods.
- **Awareness information for Boeing 767 and 757 pilots.** Although there were no other known events involving inadvertent activation of the go-around mode on a Boeing 767-series airplane, pilots of Boeing 767- and 757-series airplanes (which share a similar go-around switch design) could benefit from understanding the circumstances of this accident.
- **Adaptations of automatic ground collision avoidance technology.** The US military has successfully equipped some fighter airplanes with an automatic ground collision avoidance system that has prevented the loss of several aircraft and saved lives. Research into adapting such technology for lower-performance, less-maneuverable airplanes could have relevance for civil transport-category airplanes.
- **Cockpit image recorders.** Certain aspects of the circumstances of this accident could be better known with improved information about flight crew actions, possibly leading to additional safety recommendations for preventing similar accidents.

## Findings

1. None of the following were factors in this accident: (1) the captain's and the first officer's certifications and qualifications; (2) air traffic control services; (3) the condition and maintenance of airplane structures, powerplants, and systems; and (4) airplane weight and balance.
2. There was insufficient information to determine whether the flight crewmembers were fatigued at the time of the accident, and no available evidence suggested impairment due to any medical condition, alcohol, or other impairing drugs.
3. Whatever electronic flight instrument system display anomaly the first officer (FO) experienced was resolved to both crewmembers' satisfaction (by the FO's cycling of the electronic flight instrument switch) before the events related to the accident sequence occurred.
4. The activation of the airplane's go-around mode was unintended and unexpected by the pilots and occurred when the flight was encountering light turbulence and likely instrument meteorological conditions associated with its penetration of the leading edge of a cold front.
5. Presuming that the first officer (FO) was holding the speedbrake lever as expected in accordance with Atlas Air Inc.'s procedure, the inadvertent activation of the go-around mode likely resulted from unintended contact between the FO's left wrist or watch and the left go-around switch due to turbulence-induced loads that moved his arm.
6. Despite the presence of the go-around mode indications on the flight mode annunciator and other cues that indicated that the airplane had transitioned to an automated flight path that differed from what the crew had been expecting, neither the first officer nor the captain were aware that the airplane's automated flight mode had changed.
7. Given that the first officer (FO) was the pilot flying and had not verbalized any problem to the captain or initiated a positive transfer of airplane control, the manual forward elevator control column inputs that were applied seconds after the inadvertent activation of the go-around mode were likely made by the FO.
8. The first officer likely experienced a pitch-up somatogravic illusion as the airplane accelerated due to the inadvertent activation of the go-around mode, which prompted him to push forward on the elevator control column.
9. Although compelling sensory illusions, stress, and startle response can adversely affect the performance of any pilot, the first officer had fundamental weaknesses in

his flying aptitude and stress response that further degraded his ability to accurately assess the airplane's state and respond with appropriate procedures after the inadvertent activation of the go-around mode.

10. Had the Federal Aviation Administration met the deadline and complied with the requirements for implementing the pilot records database (PRD) as stated in Section 203 of the *Airline Safety and Federal Aviation Administration Extension Act of 2010*, the PRD would have provided hiring employers relevant information about the first officer's employment history and training performance deficiencies.
11. The first officer's long history of training performance difficulties and his tendency to respond impulsively and inappropriately when faced with an unexpected event during training scenarios at multiple employers suggest an inability to remain calm during stressful situations—a tendency that may have exacerbated his aptitude-related performance difficulties.
12. While the captain was setting up the approach and communicating with air traffic control, his attention was diverted from monitoring the airplane's state and verifying that the flight was proceeding as planned, which delayed his recognition of and response to the first officer's unexpected actions that placed the airplane in a dive.
13. The captain's failure to command a positive transfer of control of the airplane as soon as he attempted to intervene on the controls enabled the first officer to continue to force the airplane into a steepening dive.
14. The captain's degraded performance, which included his failure to assume positive control of the airplane and effectively arrest the airplane's descent, resulted from the ambiguity, high stress, and short timeframe of the situation.
15. The first officer's repeated uses of incomplete and inaccurate information about his employment history on resumes and applications were deliberate attempts to conceal his history of performance deficiencies and deprived Atlas Air Inc. and at least one other former employer of the opportunity to fully evaluate his aptitude and competency as a pilot.
16. Atlas Air Inc.'s human resources personnel's reliance on designated agents to review pilot background records and flag significant items of concern was inappropriate and resulted in the company's failure to evaluate the first officer's unsuccessful attempt to upgrade to captain at his previous employer.
17. Operators that rely on designated agents or human resources personnel for initial review of records obtained under the Pilot Records Improvement Act should include flight operations subject matter experts early in the records review process.

18. The manual process by which Pilot Records Improvement Act records are obtained could preclude a hiring operator from obtaining all background records for a pilot applicant who fails to disclose a previous employer due to either deception or having resigned before being considered fully employed, such as after starting but not completing initial training.
19. The establishment of a confidential voluntary data clearinghouse to share deidentified pilot selection data among airlines about the utility of different methods for predicting pilot success in training and on the job would benefit the safety of the flying public.
20. All pilots of Boeing 767- and 757-series airplanes (which share a similar go-around switch design) could benefit from an awareness of the circumstances of this accident that likely led to the inadvertent activation of the go-around mode.
21. The Department of Defense has developed approaches to automatic ground collision avoidance system technology for fighter airplanes that, if successfully adapted for use in lower-performance, less-maneuverable airplanes, could serve as a model for the development of similar installations in civil transport-category airplanes that could dramatically reduce terrain collision accidents involving pilot spatial disorientation.
22. An expanded data recorder that records the position of various knobs, switches, flight controls, and information from electronic displays, as specified in amendment 43 to the recorder standards of the International Civil Aviation Organization, would not have provided pertinent information about the flight crew's actions.
23. A flight deck image recording system compliant with Technical Standard Order TSO-C176a, "Cockpit Image Recorder Equipment," would have provided relevant information about the data available to the flight crew and the flight crew's actions during the accident flight.

## **Probable Cause**

The NTSB determines that the probable cause of this accident was the inappropriate response by the first officer as the pilot flying to an inadvertent activation of the go-around mode, which led to his spatial disorientation and nose-down control inputs that placed the airplane in a steep descent from which the crew did not recover. Contributing to the accident was the captain's failure to adequately monitor the airplane's flightpath and assume positive control of the airplane to effectively intervene. Also contributing were systemic deficiencies in the aviation industry's selection and performance measurement practices, which failed to address the first officer's aptitude-related deficiencies and maladaptive stress response. Also contributing to the accident was the Federal Aviation

Administration's failure to implement the Pilot Records Database in a sufficiently robust and timely manner.

## **Recommendations**

### **New Recommendations**

As a result of its investigation, the NTSB makes the following six new safety recommendations:

#### **To the Federal Aviation Administration:**

1. Inform Title 14 *Code of Federal Regulations* Part 119 certificate holders, air tour operators, fractional ownership programs, corporate flight departments, and governmental entities conducting public aircraft operations about the hiring process vulnerabilities identified in this accident, and revise advisory circular 120-68H, "Pilot Records Improvement Act and Pilot Records Database," to emphasize that operators should include flight operations subject matter experts early in the records review process and ensure that significant training issues are identified and fully evaluated.
2. Implement the pilot records database and ensure that it includes all industry records for all training started by a pilot as part of the employment process for any Title 14 *Code of Federal Regulations* Part 119 certificate holder, air tour operator, fractional ownership program, corporate flight department, or governmental entity conducting public aircraft operations regardless of the pilot's employment status and whether the training was completed.
3. Ensure that industry records maintained in the pilot records database are searchable by a pilot's certificate number to enable a hiring operator to obtain all background records for a pilot reported by all previous employers.
4. Establish a confidential voluntary data clearinghouse of deidentified pilot selection data that can be used to conduct studies useful for identifying effective, scientifically based pilot selection strategies. This program should be modeled after programs like Aviation Safety Information and Analysis Sharing and Flight Operations Quality Assurance.
5. Issue a safety alert for operators to inform pilots and operators of Boeing 767- and 757-series airplanes about the circumstances of this accident and alert them that, due to the close proximity of the speedbrake lever to the left go-around mode switch, it is possible to inadvertently activate the go-around mode when manipulating or holding the speedbrake lever as a result of unintended contact between the hand or wrist and the go-around switch.

6. Convene a panel of aircraft performance, human factors, and aircraft operations experts to study the benefits and risks of adapting military automatic ground collision avoidance system technology for use in civil transport-category airplanes and make public a report on the committee's findings.

### **Previously Issued Recommendations Reiterated in this Report**

As a result of this investigation, the NTSB reiterates the following safety recommendations to the Federal Aviation Administration:

#### **To the Federal Aviation Administration:**

Require that all existing aircraft operated under Title 14 *Code of Federal Regulations (CFR)* Part 121 or 135 and currently required to have a cockpit voice recorder and a flight data recorder be retrofitted with a crash-protected cockpit image recording system compliant with Technical Standard Order TSO-C176a, "Cockpit Image Recorder Equipment," TSO-C176a or equivalent. The cockpit image recorder should be equipped with an independent power source consistent with that required for cockpit voice recorders in 14 *CFR* 25.1457. (A-15-7)

Require that all newly manufactured aircraft operated under Title 14 *Code of Federal Regulations (CFR)* Part 121 or 135 and required to have a cockpit voice recorder and a flight data recorder also be equipped with a crash-protected cockpit image recording system compliant with Technical Standard Order TSO-C176a, "Cockpit Image Recorder Equipment," or equivalent. The cockpit image recorder should be equipped with an independent power source consistent with that required for cockpit voice recorders in 14 *CFR* 25.1457. (A-15-8)

### **Previously Issued Recommendations Reiterated and Classified in The Report**

As a result of its investigation, the NTSB reiterates and classifies the following four safety recommendations:

#### **To the Federal Aviation Administration:**

Require all Part 121 and 135 air carriers to obtain any notices of disapproval for flight checks for certificates and ratings for all pilot applicants and evaluate this information before making a hiring decision. (A-05-1) Classified "Open—Unacceptable Response"

Require 14 *Code of Federal Regulations* Part 121, 135, and 91K operators to document and retain electronic and/or paper records of pilot training and checking events in sufficient

detail so that the carrier and its principal operations inspector can fully assess a pilot's entire training performance. (A-10-17) Classified "Open—Unacceptable Response"

Require 14 *Code of Federal Regulations* Part 121, 135, and 91K operators to provide the training records requested in Safety Recommendation A-10-17 to hiring employers to fulfill their requirement under the Pilot Records Improvement Act. (A-10-19) Classified "Open—Unacceptable Response"

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) Classified "Open—Unacceptable Response"