



# National Transportation Safety Board

## Aviation Safety and the MWL +

Member Michael Graham  
September 14, 2021

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AVIATION



HIGHWAY



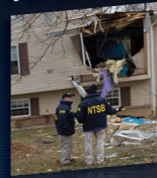
MARINE



RAILROAD



PIPELINE



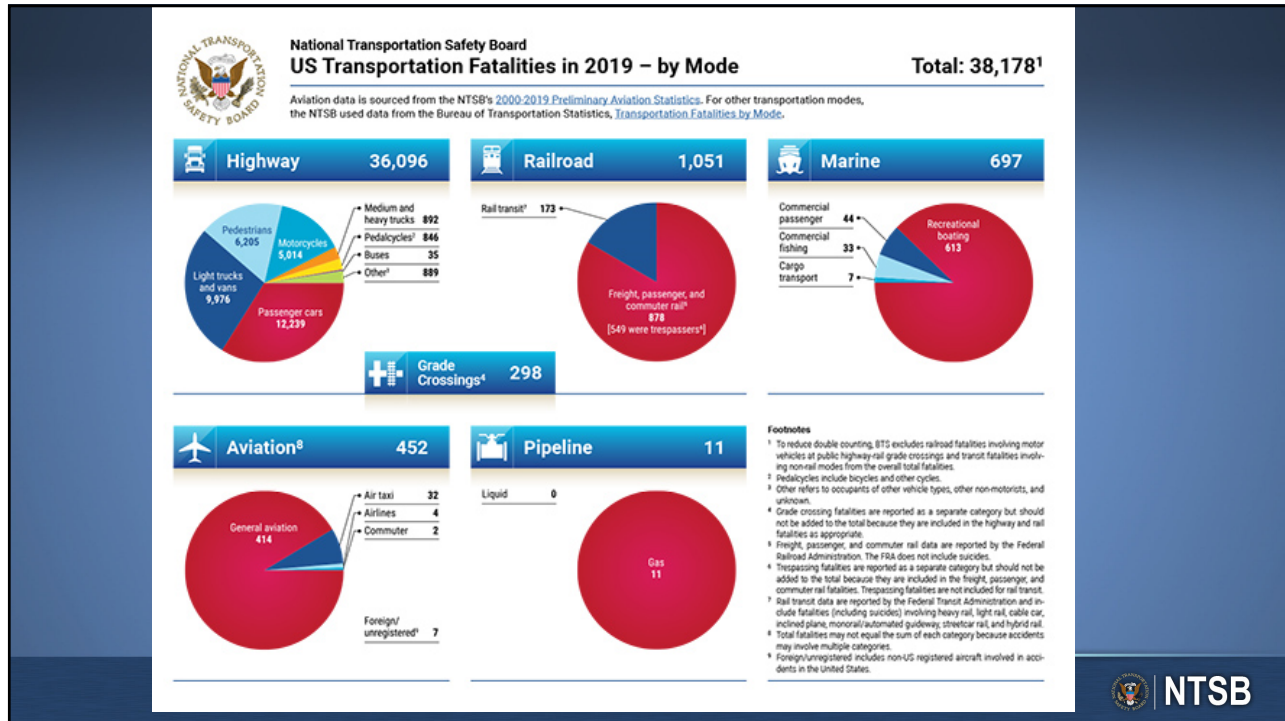
## Our Mission

The NTSB is an independent Federal agency charged by Congress with **investigating** every civil aviation accident in the United States and significant accidents in the other modes of transportation – highway, marine, railroad and pipeline – and **issuing safety recommendations** aimed at preventing future accidents.

**NTSB**

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## BOARD MEMBERS AND STAFF


5 Board Members

- Chair Jennifer Homendy
- Vice Chairman Bruce Landsberg
- Member Michael Graham
- Member Thomas Chapman
- Vacant


• 400 staff  
 (HQ, 4 Regional Offices, Training Center)




Chair  
Jennifer Homendy




Vice Chairman  
Bruce Landsberg



Member  
Michael Graham



Member  
Thomas Chapman

 **NTSB**

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## Investigative Groups

		All Modes		
		Operations		
		Weather		
		Human Performance		
		Survival Factors		
		Systems		
		Vehicle Recorders		
		Maintenance Records		
		Witness Reports		
Aviation	Rail		Highway	Marine
ATC	Track		Motor Carrier	Engineering
Aircraft Performance	Signals		Vehicle	
Powerplants			Highway	
Structures			Forensic Mapping*	

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## NTSB SAFETY RECOMMENDATIONS

- Safety recommendations are the Board’s most important product
- Developed to remedy system, hardware, operational or policy failures identified during investigations or safety studies



“These safety recommendations, if acted upon, would prevent future tragedies similar to these.”

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- Require and Verify the Effectiveness of Safety Management Systems in all Revenue Passenger-Carrying Aviation Operations
- Install Crash-Resistant Recorders and Establish Flight Data Monitoring Programs
- Implement a Comprehensive Strategy to Eliminate Speeding-Related Crashes
- Protect Vulnerable Road Users through a Safe System Approach
- Prevent Alcohol- and Other Drug-Impaired Driving
- Require Collision-Avoidance and Connected-Vehicle Technologies on all Vehicles
- Eliminate Distracted Driving
- Improve Passenger and Fishing Vessel Safety
- Improve Pipeline Leak Detection and Mitigation
- Improve Rail Worker Safety

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## WHY IS SMS ON THE 2021-2022 MWL?

- NTSB continues to investigate preventable Part 135 and 91 accidents from operators without an effective SMS
- Oversight is necessary to ensure an effective SMS



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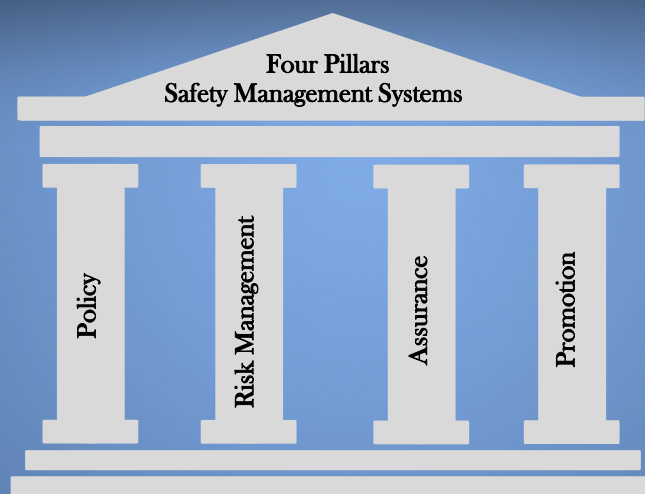
## WHAT IS A SAFETY MANAGEMENT SYSTEM?

- Not a book or policies on the shelf
- Elevating safety conscious behavior throughout the organization
- Every day, Every task

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## FOUR PILLARS



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## SAFETY POLICY

- Defining Roles and Responsibilities
- An Engaged Accountable Executive
- Employee Engagement and Role in an Effective SMS
- **Safety Promotion**

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## SAFETY RISK MANAGEMENT

- Change Management
- How do you know what you don't know?
  - Iceberg of Ignorance
- Employee Reporting
- **Safety Promotion**



Image Source: <https://bobbyalbert.com/iceberg-of-ignorance/>  
Credit to Sidney Yoshida who popularized the concept in 1989

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## SAFETY ASSURANCE

- Safety Data Sharing Systems
- Audits/Oversight
- NTSB Recommendation: FAA Oversight of 135 operators and 91 revenue-passenger carrying operations
- Flight Data Monitoring
- **Safety Promotion**



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## ASIAS

- Does your flight operation take advantage of this program?
- What can it provide your operation?
- What is the #1 FDM exceedance in GA?
- Un-stabilized approach during a visual approach
- Review Stabilized Approach Criteria

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## National Transportation Safety Board



Source: Jehan M. Ghouse, [www.airliners.net](http://www.airliners.net)

Atlas Air, Flight 3591  
Boeing 767-375BCF  
Trinity Bay, Texas  
February 23, 2019

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### Initial Information

- Scheduled flight from Miami to Houston
- Small area of convective weather flying into Houston
- First officer (FO) was pilot flying
- Boeing 767 Crashes in Trinity, Bay TX at 1239:03 on February 21, 2019

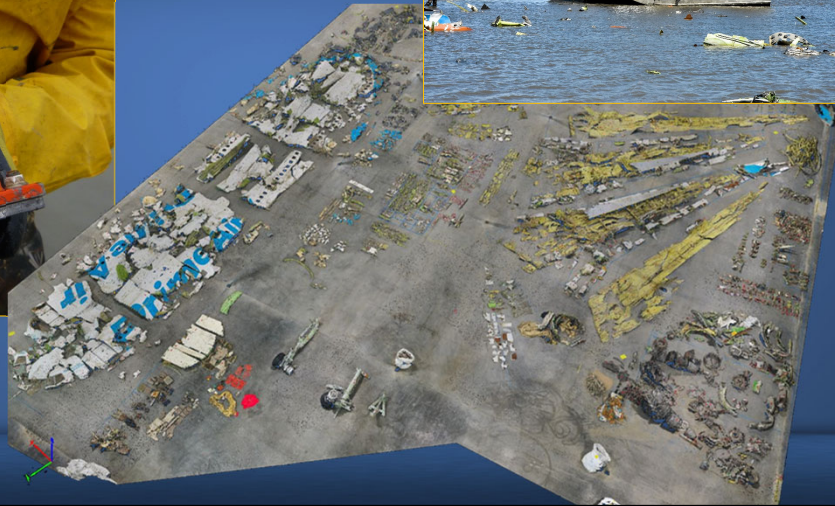
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## The NTSB Arrives On Scene



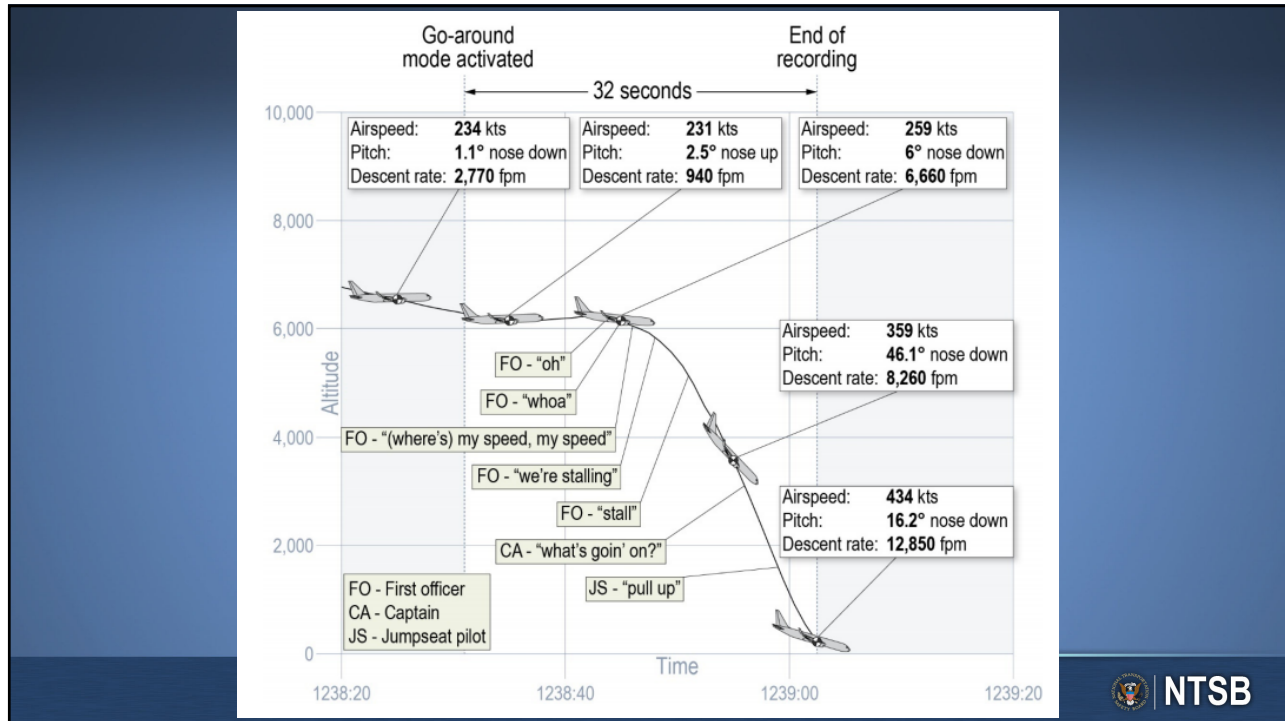
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## Timeline of Events

- 1238:31: Go-Around (GA) Switch Activated
- 1238:36: Manual controls commanded nose-down
- 1238:44: FO said “oh” “woah” “where’s my speed... we’re stalling”
- 1238:56: Captain asked, “What’s going on?”
- 1238:56: Nose-up controls were held for 7 seconds
- 1239:03: End of recording

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## Flight Deck Events

**12:38:34**

**232 kts**      **GO AROUND**      **6,151 ft**

**Altitude (feet)**  
 8,000  
 6,000  
 4,000  
 2,000  
 0

Cloud Base

5 NM  
 Distance

**SPD BRK**      **Thrust Levers**

Down Arm      Max      Idle

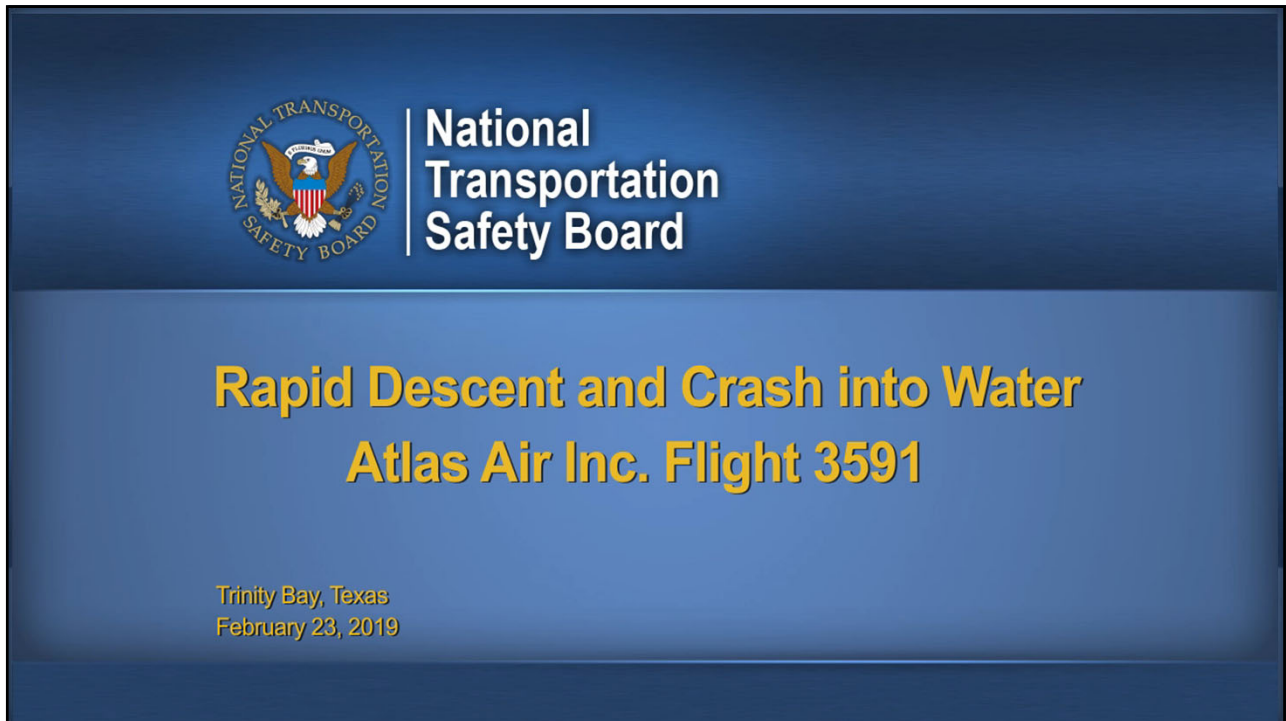
**CAM** [Sound of click.]

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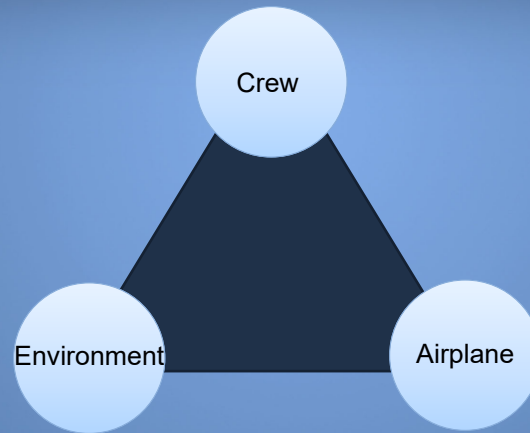


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## System Approach To Investigations



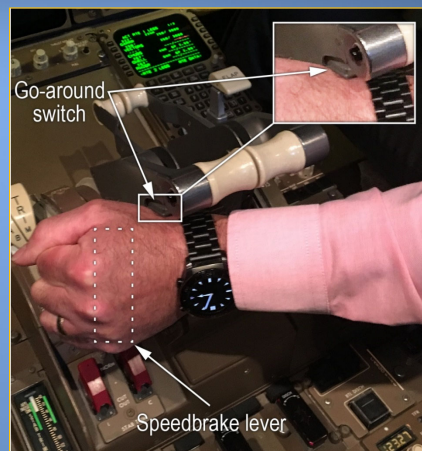
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## Airplane – Go-Around Switch

- Speedbrakes extended for expedited descent
- Procedure: Guard speedbrake handle
- FO's arm close to GA switches while flying through convective weather pattern



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## Airplane – Go-Around Switch

**NTSB FINDING:** 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

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## Airplane – Go-Around Switch

**NTSB RECOMMENDATION:** To the FAA – 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. (A-20-37)

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## AIRPLANE- GO-AROUND SWITCH

- Design Considerations:
  - Proximity of pilot's wrist to GA switch to speedbrake handle—what if pilot is wearing a watch?
  - Procedure requiring pilot to hold speedbrake handle during automated flight control systems engaged and the speedbrakes extended
  - Likelihood of inadvertent activation of GA switch
  - Severity if GA switch is inadvertently activated
- Takeaway: Design a system to prevent human error

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## Pilot – Captain

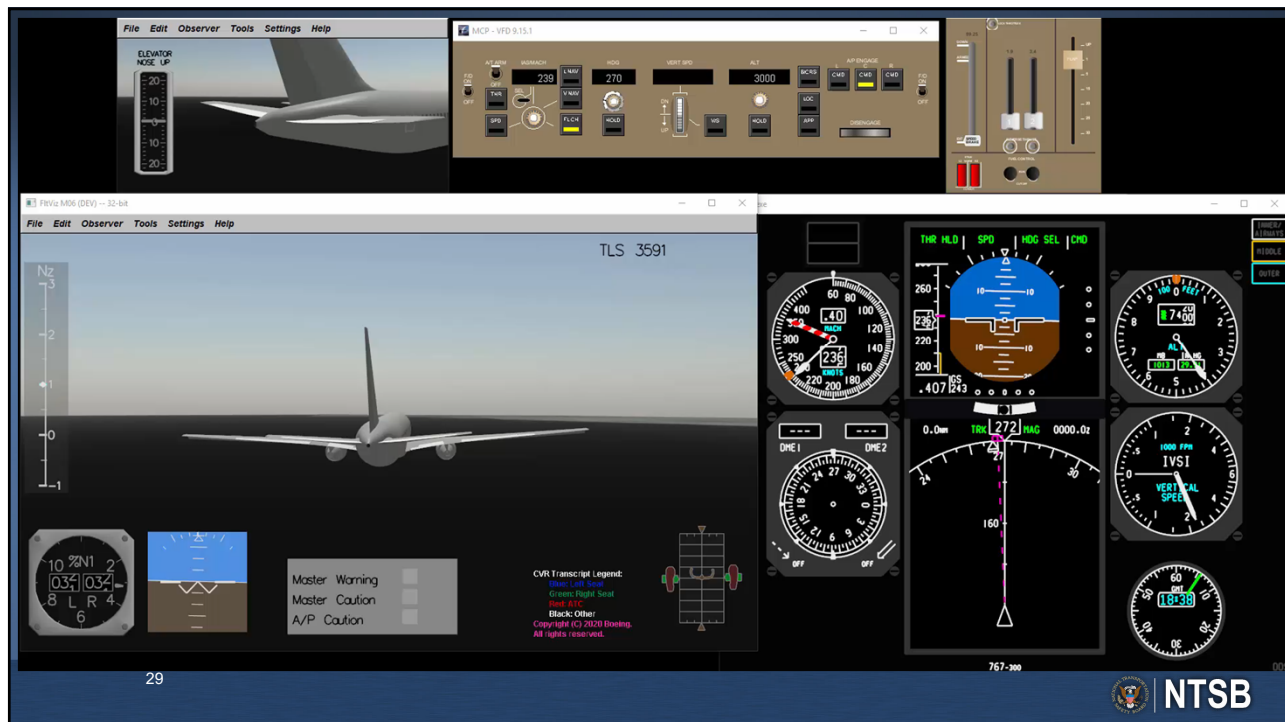
- Between 1238:46 and 1238:56: The right elevator was in a more airplane nose-down position than the left elevator
- This means that 15 seconds after the FO commanded nose-down, the captain pulled back on his controls attempting to recover the aircraft while the FO continued pressing forward
- Without a positive transfer of controls, the captain's attempt to recover the aircraft was futile



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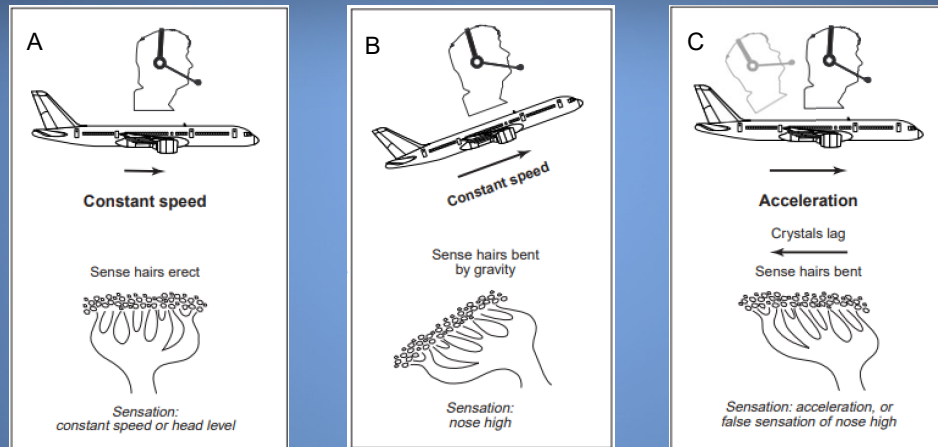
## Pilot – First Officer

- After inadvertent activation of GA switch, forward acceleration increased, first officer:
  - Pushed forward on control column
  - Reduced airplane's pitch
- FO: "Oh" "Woah" "Where's my speed...we're stalling"
- Inputs consistent with pitch up illusion (somatogravic illusion)
- Attention fully absorbed by misleading sensations

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## Somatogravic Illusion



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## Pilot – First Officer

- First officer repeatedly overwhelmed by novel, complex, or unexpected situations
- Atlas instructors attributed his difficulties to external circumstances or low confidence
- Long history of significant performance difficulties indicative of low aviation aptitude

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## ENVIRONMENT – Industry

- Airlines need systematic, scientifically-based approach to pilot selection
- Airlines would benefit from:
  - Improved pilot selection and performance measures
  - Clearinghouse of deidentified selection data to improve and validate pilot selection strategies

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## Environment – The FAA

- FO omitted AirWisconsin and Commut Air from resume (FO failed to complete initial training at both employers)
- Current pilot background check (PRIA) relies on pilot honesty on resume and application
- Atlas Air was unaware of FO's failures at those airlines

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## Environment – The FAA

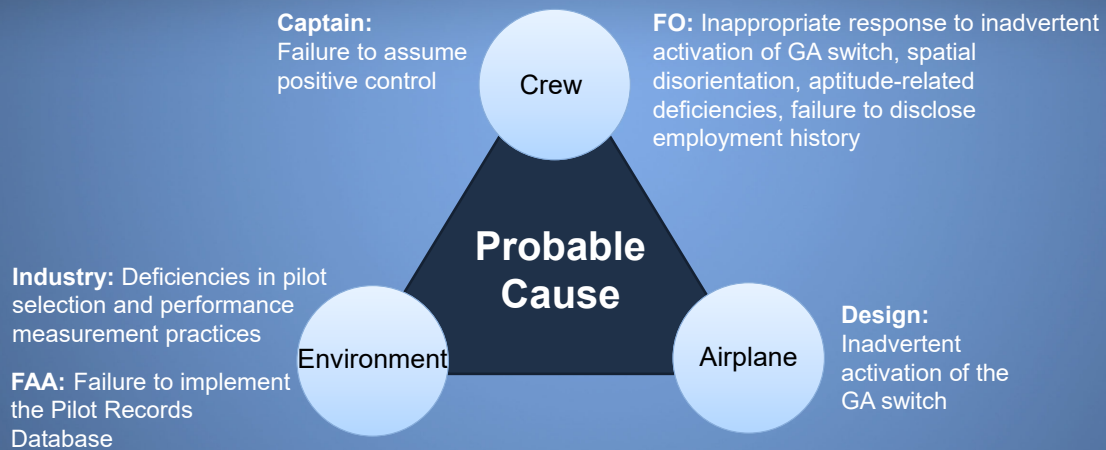
- 2010: Congress mandated the Pilot Records Database (PRD) to replace PRIA and improve timeliness and efficient of obtaining pilot records and allow employer access to pilots' former employer records
- 2016: Congress, frustrated with the FAA's slow implementation, imposed April 2017 deadline
- April 2017: FAA missed Congress' deadline
- July 2017: FO hired by Atlas Air
- February 2019: Accident Date
- May 2021: FAA releases final rule on PRD

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## SYSTEM APPROACH TO INVESTIGATIONS



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## PROBABLE CAUSE

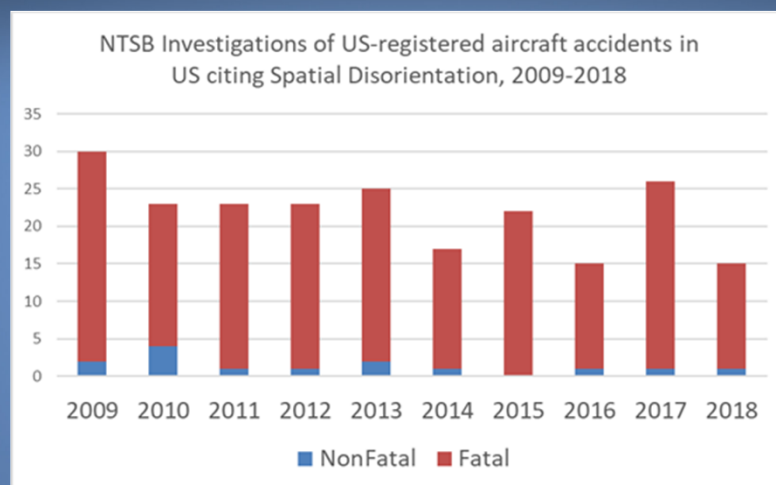
The NTSB determines that the probable cause of this accident was the inappropriate response by the first officer as the pilot flying to an inadvertent activation of the go-around mode, which led to his spatial disorientation and nose-down control inputs that placed the airplane in a steep descent from 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

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## SPATIAL DISORIENTATION



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## ASIAS GA ISSUES AND TRENDS

- RUUDY 6 Departure KTEB
- TCAS RA hot spots
- Growing trends:
  - Gross navigational errors due to not verifying FMS programming (SOPs)
  - Below G/S landings on visual approaches
  - TCAS RA deviations caused by FMS reprogramming errors during descend via clearances

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## EMERGENCY RESPONSE PLAN

- Does your company have a plan?
- Is it ready to respond?
- Media response
  - Not responding or incorrect response only creates a negative image
- HR
  - NOK notification
  - Employee assistance
- NTSB has classes to help
- Policy on the # of executives on one airplane?

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## CONNECT WITH NTSB



@NTSB



@MikeGrahamNTSB



@NTSBgov



NTSB Podcast



@NTSBgov



NTSB Blog – Safety Compass



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[youtube.com/user/NTSBgov](https://www.youtube.com/user/NTSBgov)

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