Atlas Air Inc., Flight 3591
Boeing 767-375BCF
Trinity Bay, Texas
February 23, 2019
Human Performance Presentation

Source: Jehan M. Ghouse, www.airliners.net
Crew Mode Awareness

Mode Displays

Flight Mode Annunciator

Engine Indicating and Crew Alerting System

Flight Mode Annunciator
Flight Crew Mode Awareness
Crew Mode Awareness

• Pilots can miss displayed mode changes
• Crew did not:
  • Acknowledge mode change
  • Select different mode
  • Verbalize anything unexpected was happening
• Crew lacked awareness of mode change
First Officer’s Response

• Expected airplane to level off at 3,000 ft
• When airplane stopped descending, first officer retracted speedbrakes
• Likely sensed a change and reacted without fully assessing situation
First Officer’s Response

• As forward acceleration increased, first officer:
  • Pushed forward on control column
  • Reduced airplane’s pitch
• Inputs consistent with pitch up illusion (somatogravic illusion)
Somatogravic Illusion

First Officer’s Response

• Exclaimed “where’s my speed” and “we’re stalling
• Attention fully absorbed by misleading sensations
• Continued pushing forward on control column
Captain’s Response

• Had been setting up for the approach and communicating with ATC
• Delayed his recognition of changes in airplane state
• Delayed intervention is common in cases of pilot subtle incapacitation
Captain’s Response

• Likely experienced startle and surprise
• Asked what was happening, but first officer made only panicked statements
• Failure to assume positive control likely resulted from the ambiguity, stress, and time-limited nature of situation
Spatial Disorientation Accidents Involving Somatogravic Illusion

- 1994 – DC-9 Charlotte, North Carolina
- 2000 – A-320 Muharrag, Bahrain
- 2006 – A-320 Sochi, Russian Federation
- 2010 – A-330 Tripoli, Libya
- 2013 – CRJ-200 Kyzyltu, Kazakhstan
- 2013 – B737-500 Kazan, Russian Federation
- 2016 – B737 Rostov-on-Don, Russian Federation
Auto GCAS Technology

- Department of Defense (DoD) developed automatic ground collision avoidance (auto GCAS) technology for fighter aircraft
- DoD researching for Lockheed C-130
- Adaptation of auto GCAS to civil transport category airplanes could reduce accidents
Pilot Selection and Performance Measures

• 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
Pilot Selection and Performance Measures

- 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