

National Transportation Safety Board

A Human Factors Analysis of the Asiana Flight 214 Accident

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MENASASI Seminar, Dubai, United Arab Emirates, 5 November, 2015

Accident Information

- July 6, 2013
- Boeing 777-200ER
- Scheduled flight
- Seoul \rightarrow San Francisco
- Training flight



- Visual meteorological conditions
- Light winds



Crew Information





Accident Information





Accident Information





Investigation



- Extensive media coverage
- Joint Ops / HP group

- Full go-team launch
- NTSB Chairman on Scene



Investigating Human Factors

"... from unsafe acts and inadequate or removed defenses, through the accident trajectory, all the way back to uppermanagement levels."







NTSB Probable Cause Statement

"...the flight crew's mismanagement of the airplane's descent during the visual approach, the pilot flying's unintended deactivation of automatic airspeed control, the flight crew's inadequate monitoring of airspeed, and the flight crew's delayed execution of a go-around after they became aware that the airplane was below acceptable glidepath and airspeed tolerances."



NTSB Probable Cause Statement

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"...the flight crew's mismanagement of the airplane's descent during the visual approach, the pilot flying's unintended deactivation of automatic airspeed control, the flight crew's inadequate monitoring of airspeed, and the flight crew's delayed execution of a go-around < 4 after they became aware that the airplane was below acceptable glidepath and airspeed tolerances."



Probable Cause



Flightcrew's mismanagement of airplane's descent PF's unintended deactivation of automatic airspeed control Flightcrew's inadequate monitoring of airspeed

Flightcrew's delayed initiation of a go-around



Probable Cause



Flightcrew's mismanagement of airplane's descent PF's unintended deactivation of automatic airspeed control

Flightcrew's nondetection of the PF's error Flightcrew's inadequate monitoring of airspeed

Flightcrew's delayed initiation of a go-around





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NTSB









Arrival





Mismanagement of the Descent



¹⁶ *Notations on the figure are approximate

NTSB

Mismanagement of the Descent



17 *Notations on the figure are approximate



Mismanagement of the Descent



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- Pilots "often lack sufficient in-depth knowledge and skills to most efficiently and effectively accomplish flightpath management related tasks" *
- The PF had practiced speed-restricted, high energy, straight-in visual approaches without a glideslope
- Flight path management skills can atrophy from lack of practice







Deactivation of Automatic Airspeed Control



²⁰ *Notations on the figure are approximate



Deactivation of Automatic Airspeed Control

	A/P Status	A/P Pitch	A/T Thrust	Speed Control
1	A/P	V/S	SPD	With thrust (A/T)
2	A/P	FLCH SPD	THR	With elevator (A/P)
3	FLT DIR	FLCH SPD	THR	With elevator (Pilot)
4	FLT DIR	FLCH SPD	HOLD	With elevator (Pilot)
5		FLCH SPD	HOLD	Not specified

Deactivation of Automatic Airspeed Control



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- Pilots often have difficulty comprehending subtle interconnections between aircraft sub-systems and AFCS mode logic
- Much learning occurs on the line
 - Gaps in pilot mental models are problematic in dynamic, nonroutine situations, and can lead to "automation surprise"
- FAA and EASA had described certain aspects of the 777 AFDS/AT system as unintuitive
- 777 AFCS documentation and training was not sufficiently clear and comprehensive



777 Stall Protection System Training

Stall Protection Feature

- Reduces the possibility of reaching stick shaker
- · No trim below minimum maneuvering speed
- Slow speed requires continuous back pressure
- Autofinerties engage automatically



AUTO











Flightcrew Non-Detection of the PF's Error





Flightcrew Non-Detection of the PF's Error



- The instructional nature of the flight led to blurring of PF and PM roles
- This lessened adherence to SOPs involving mode selections and callouts
- The PM was occupied with a configuration task when the PF's mode selection occurred
- The flightcrew did not detect the FLCH selection or subsequent, related mode changes
- Pilots often overlook unexpected mode changes
- The absence of a callout contributed to the flightcrew's degraded mode awareness







Inadequate Monitoring of Airspeed



²⁸ *Notations on the figure are approximate



Inadequate Monitoring of Airspeed



- The crew expected the A/T would maintain selected speed
- The thrust levers behaved as expected (at idle) for 50 seconds after the A/T transitioned to HOLD
- Airspeed reached V_{approach} at 500 feet
- Workload was high on short final
- Monitoring of automated sub-systems decreases as workload increases (automation reliance)
- The PF did not use pitch trim
- The crew was fatigued, degrading vigilance
- First officer's view of primary displays partially obscured







Delayed Go-Around



³¹ *Notations on the figure are approximate



Delayed Go-Around



- Flightcrew response times are longer for unexpected events
- PM: "It's low" was nonspecific and possibly contributed to a delay in addressing the low airspeed
- The PF and PM each thought the other was responsible for initiating a go around



Low Speed Alert



³³ *Notations on the figure are approximate







Flight Crew Fatigue





Instructor pilot's inadequate supervision of the pilot flying



Recommendation Areas



For a Complete List of Findings and Recommendations, see the NTSB final report:

http://www.ntsb.gov/investigations/summary/AAR1401.html

Descent Below Visual Glidepath and Impact With Seawall Asiana Airlines Flight 214 Boeing 777-200ER, HL7742 San Francisco, California July 6, 2013







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