PAY ATTENTION!
WHAT ACCIDENT INVESTIGATIONS REALLY REVEAL ABOUT DRIVER AND PILOT ALERTNESS

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Potential Sources of Information

- Interviews
- AME Records
- Other Medical Records
- Toxicological Tests
- Cell Phone Records
- Hotel Records
- Physical Evidence
- Other Sources
- 72-Hour History
- Autopsies
- Other Sources
Alertness is the state of active attention by high sensory awareness such as being watchful and prompt to meet danger or emergency, or being quick to perceive and act. It is related to psychology as well as to physiology. A lack of alertness is a symptom of

1. a: watchful and prompt to meet danger or emergency
   - an alert guard
   - trying to stay alert to possible problems
   - b: quick to perceive and act
   - mentally alert
Human Factors that Affect Alertness

- Fatigue
- Automation reliance/automation complacency
- Change blindness
- Inattention blindness
Port Arthur, Texas. 2010

Birmingham, Alabama. 2013

Palm Springs, CA. 2016

Fatigue
Fatigue

- Chicago. 2015
- New York City. 2013
• “...some investigations have found that alerters were likely reset by reflex action with no increase in crew alertness...”

– NTSB Safety Recommendation R-15-004
NTSB is calling for a comprehensive approach to combatting fatigue in transportation, focusing on:

- research
- education and training
- technology
- sleep disorder treatment
- hours-of-service regulations
- and on and off-duty scheduling policies and practices.
Alertness and Automation

• Humans are not wired to monitor highly reliable, highly automated systems for extended periods of time.
“Once you put pilots on automation, their manual abilities degrade and their flight path awareness is dulled: flying becomes a monitoring task, an abstraction on a screen, a mind-numbing wait for the next hotel.”

- William Langewiesche, *Vanity Fair*, October 2014
Automation’s Role in Potentially Dulling Alertness

• “The changing role of the human operator from active controller to passive monitor, as exemplified by the modern airline pilot, has not eliminated the vigilance problem, but merely changed it.”  
  – Parasuraman, 1987

• “The microprocessor revolution has demanded, not less, but more of the human monitor.”  
  – Wiener, 1987
“Automation is a double-edged sword. It gives us lots of advantages. It can reduce workload. It can fly the plane more precisely, but it puts us a step away from the system, and that makes monitoring even more challenging.”

– Key Dismukes
Who or what first detected the flight path deviation?

<table>
<thead>
<tr>
<th>Deviation first detected by:</th>
<th>Number of Incident Reports</th>
</tr>
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<tbody>
<tr>
<td>ATC</td>
<td>49</td>
</tr>
<tr>
<td>Cockpit alerting system</td>
<td>22</td>
</tr>
<tr>
<td>Jumpseat rider</td>
<td>1</td>
</tr>
<tr>
<td>Crewmember</td>
<td>32</td>
</tr>
</tbody>
</table>

72

Someone or something other than the operating crew first detected the flight path deviation in 72 of 104 reports.

\[ \chi^2 = 15.39, \ df = 1, \ p < 0.001. \]
Asiana flight 214

- July 6, 2013
- San Francisco, California
- 3 Fatalities
CAM-3: sink rate sir.
RDO-1: tower Asiana two one four short final.
CAM-3: sink rate sir.
RDO-1: tower Asiana two one four short final.
From the NTSB Accident Report:

• “Human factors research has demonstrated that system operators often become complacent about monitoring highly reliable automated systems when they develop a high degree of trust in those systems and when manual tasks compete with automated tasks for operator attention.”

— (Parasuraman and Manzey 2010, 381-410).
“... the car driver’s inattention due to overreliance on vehicle automation.”

Courtesy of Florida Highway Patrol
“Monitoring steering wheel torque provides a poor surrogate means of determining the automated vehicle driver’s degree of engagement with the driving task.”

− NTSB report of Williston, Florida crash
Culver City, California.
January 22, 2018
Probable Cause

- The Tesla driver’s lack of response to the stationary fire truck due to his inattention and overreliance on the vehicle’s advanced driver assistance system;
- The Tesla Autopilot design, which permitted the driver to disengage from the driving task;
- The driver’s use of the system in ways inconsistent with guidance and warnings from the manufacturer.
Across domains, automation complacency has been identified as a critical consequence of automation -- a decrement in performance that results from less-than-adequate monitoring of an automated system by a human operator.
• “Detection of automation failure is poorer for systems that have a low failure rate.
• “In other words, the better the automation system, the more likely the operator is to become complacent and not detect its failure.”
“The vehicle operator’s prolonged visual distraction, a typical effect of automation complacency, led to her inability failure to detect the pedestrian in time to avoid the collision.”
Change Blindness

• “People are surprisingly poor at detecting even gross changes in a visual stimulus if they occur in objects that are not the focus of attention.”

• Automation can provide many benefits, but the possibility of over-reliance on automation and automation complacency is real.

• To counter these tendencies, we need effective means of determining and ensuring driver and pilot alertness and engagement.

• Today should provide many great thoughts on where to go from here.