



National Transportation Safety Board

Human Performance Issues

Asiana Flight 214, B777
San Francisco, CA
July 6, 2013

Senior Human Performance Investigator



Human Performance Issues

- Flightpath management
- Understanding of automation
- Communication and coordination
- Monitoring
- Go-around decision-making

Human Performance Issues

- Context-dependent, low energy alerting systems
- Expanded low speed protection

Flightpath Management

- Airplane high at 5 nautical miles
 - Delayed deceleration and configuration
 - Increased flight crew workload
 - » Degraded monitoring
 - » Increased opportunity for error
 - » Reduced likelihood of error detection

Understanding of Automation

- Complex autoflight system logic, inadequate documentation and training
- PF had an inaccurate understanding of the system
 - Did not correctly anticipate the effect of his actions on airspeed control
 - Did not understand the A/T automatic engagement feature

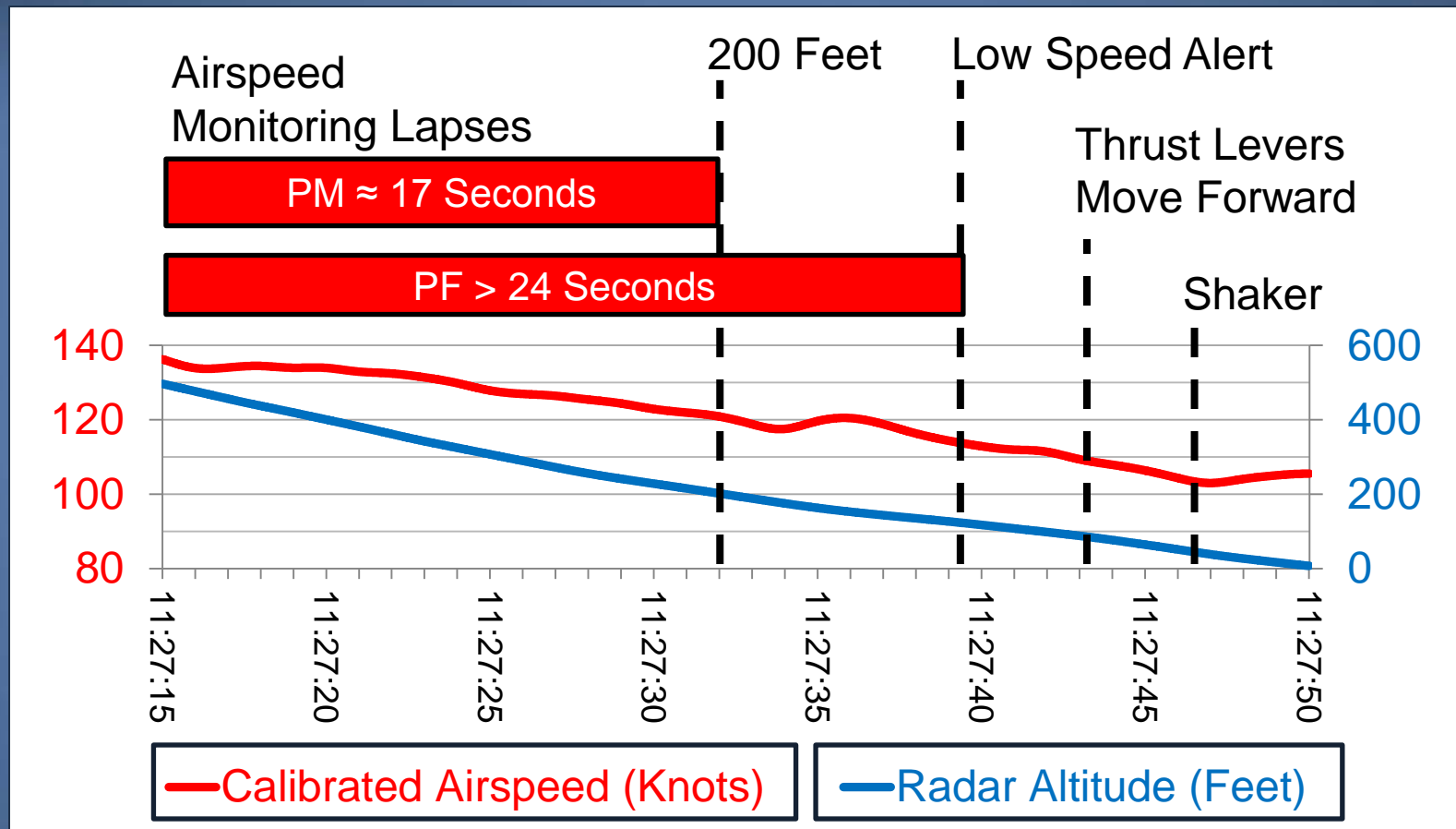
Communication and Coordination

- Asiana SOPs specified that when the A/P was ON:
 - The PF operated the MCP, called out selections
 - The PM verified, called out mode changes
- The flight crew did not consistently follow these SOPs throughout the approach

Communication and Coordination

- The PF did not call out his selection of FLCH
- The PM and observer did not notice:
 - The PF's selection
 - Subsequent, related mode changes

Monitoring

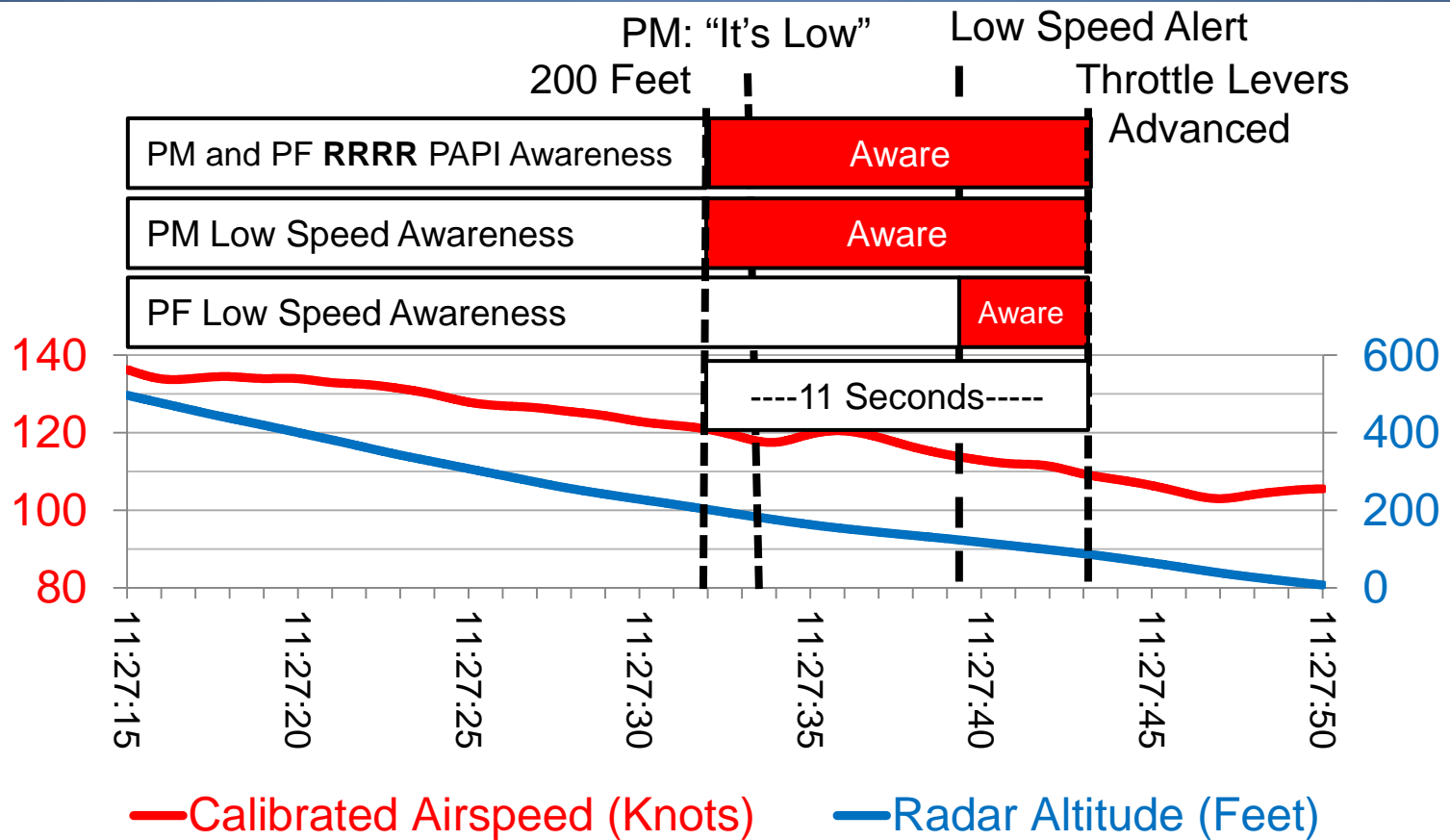


Monitoring

The flight crew did not effectively monitor
airspeed below 500 feet

- Expectancy
- Automation reliance
- Increased workload
- Fatigue

Go-Around Decision-Making



Go-Around Decision-Making

Delayed go-around

- Surprise
- Nonstandard communication
- Role confusion

Low Airspeed / Low-Energy Alerting

777 low airspeed alert

- Provided visual and aural indication of low speed condition
- Occurred too late to change the outcome of this accident
- Presented as a less urgent “caution” instead of “warning” alert

Low Airspeed / Low-Energy Alerting

Context-dependent, low-energy alert could:

- Jointly consider
 - Speed
 - Altitude
 - Flight crew response time
 - Engine spool-up time
- Determine most appropriate activation threshold and method of presentation

Expanded Low Speed Protection

- 777 autothrottle system characteristics
 - Maintained the selected speed when A/T was ON and in SPD mode
 - Provided low speed protection in some pitch modes when A/T was disengaged and ARMED
 - Did not maintain selected speed or provide low speed protection when the A/T was ON and in HOLD mode

Expanded Low Speed Protection

If automatic low speed protection had been available in HOLD mode, it likely would have increased power 20 seconds before impact



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