National Transportation Safety Board

What's the NTSB Up To These Days?

Robert L. Sumwalt, III

Aircraft Accident Investigations

NTSB Aviation Accident Involvement: 2013

Domestic

- 1313 accidents
  - 224 fatal accidents
  - 396 fatalities

Foreign

- 203 (Annex 13 Accredited Representatives)

On the Quasi-Judicial Side

In 2013

- ALJs closed 303 cases
- Held 63 hearings
- 40 cases were appealed to the full Board
- Board reversed ALJ 3 times
- 10 cases were appealed to federal courts
  - 3 U.S. Court of Appeals (Still pending)
  - 7 U.S. District Courts (the Board was affirmed in 4 cases; 3 still pending)
- The Board was reversed in 1 case that was filed with the DC Circuit in 2012

The Board

Earl Weener

Robert Sumwalt

Chris Hart

Mark Rosekind

Asiana flight 214

- July 6, 2013
- San Francisco, California
- 3 Fatalities

NTSB

ASIANA AIRLINES

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Spirit of America
UNITED STATES OF AMERICA

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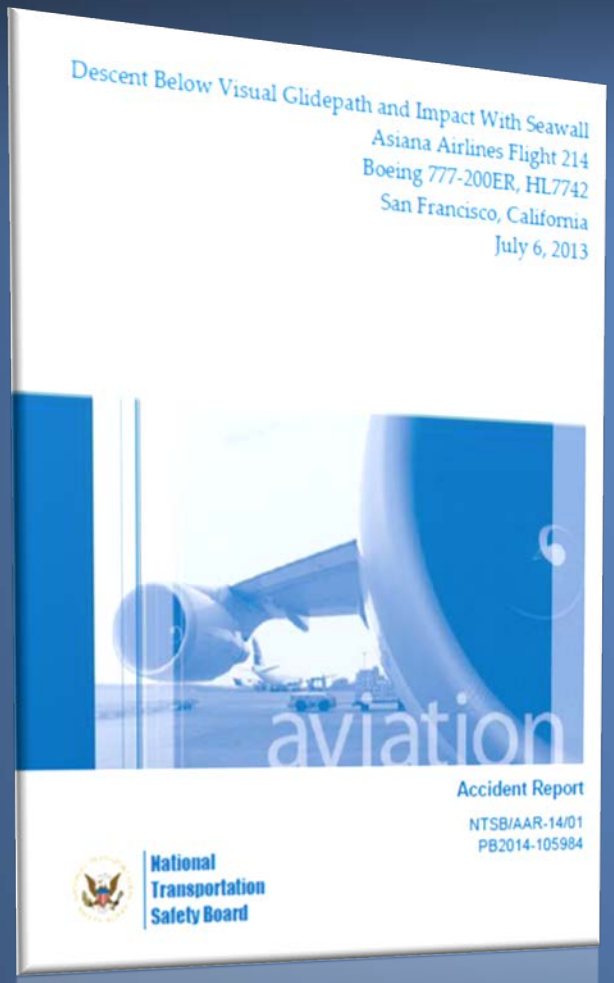
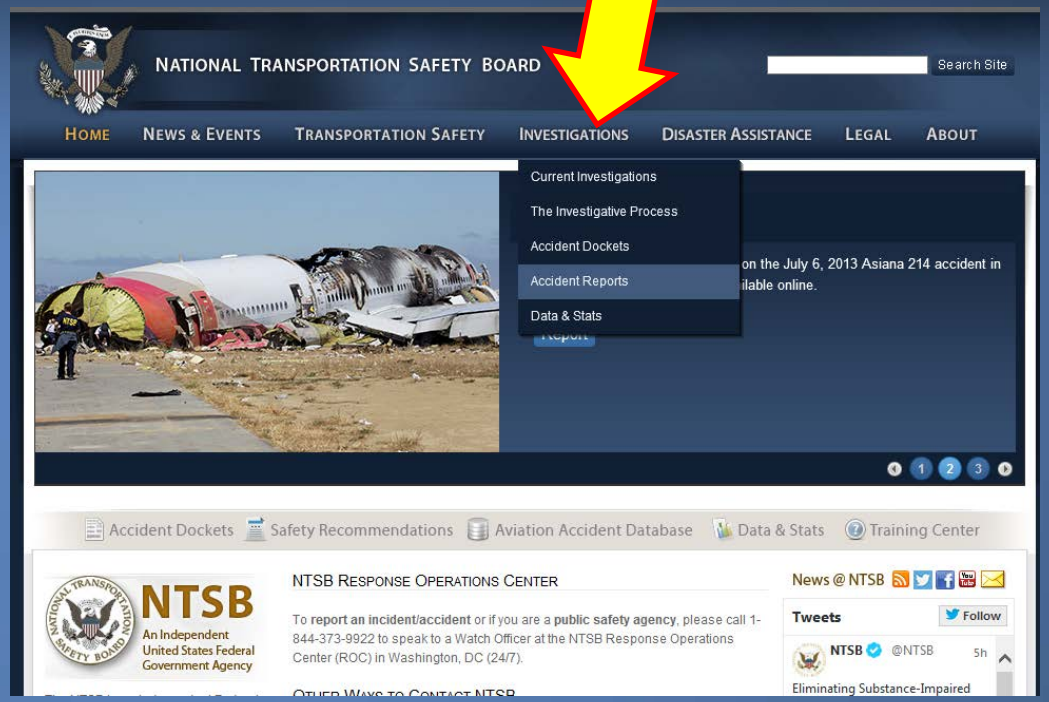
Investigative Hearing

NTSB

June 24 Board Meeting

www.ntsb.gov


Descent Below Visual Glidepath and Impact With Seawall
Asiana Airlines Flight 214
Boeing 777-200ER, HL7742
San Francisco, California
July 6, 2013
aviation
Accident Report
NTSB/AAR-14/01
PB2014-105984
National Transportation Safety Board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on the July 6, 2013 Asiana 214 accident in
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NTSB
An Independent United States Federal Government Agency
NTSB RESPONSE OPERATIONS CENTER
To report an incident/accident or if you are a public safety agency, please call 1-844-373-9922 to speak to a Watch Officer at the NTSB Response Operations Center (ROC) in Washington, DC (24/7).
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Eliminating Substance-Impaired

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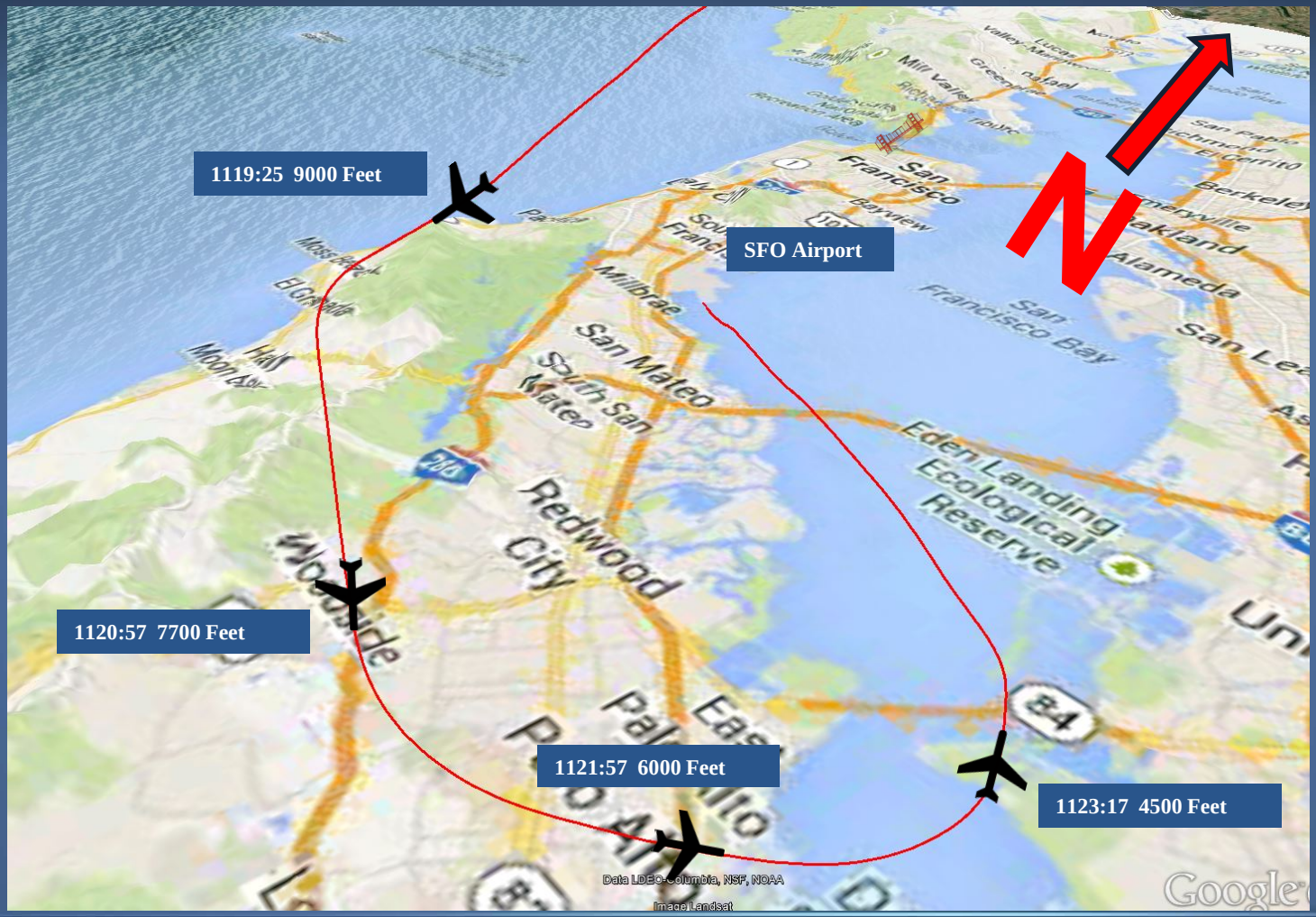
Read the latest from the Safety Compass blog.
Speeches and Testimony
Board member and staff remarks concerning transportation safety:
Acting Chairman Christopher Hart
Member Robert Sumwalt
Member Mark R. Rosekind
Member Earl F. Weener
NTSB

General Details

- 10 ½ hour flight from Korea
- Clear skies, light winds
- About 1128 am local time
- Visual approach
- Glideslope out of service
- 3 Fatal injuries
- 49 serious injuries
- 138 minor injuries
- 117 no injuries

Arrival Information



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Pilot Roles and Experience

- LEFT SEAT: Pilot Flying
  - 9,700 hours total
  - 45 hours in B777
- RIGHT SEAT: Instructor Pilot
  - 12,000 hours total
  - 3,200 hours in B777
  - New B777 instructor, first trip as instructor
- JUMPSEAT: Relief Pilot (First Officer)

Flight Mode Annunciator

Mode Control Panel

Primary Flight Display

Disconnect switches

Photos are for orientation purposes only and do not reflect the exact status of the accident airplane.

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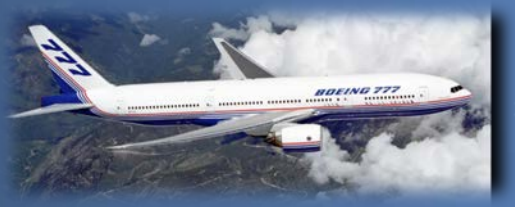
777 Mode Control Panel

Flight Level Change (FLCH) Button

Altitude Select Window



5000 feet

CLIMB Thrust

Altitude Above You

IDLE Thrust

Altitude Below You

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Final Approach Before FLCH Selected

Final Approach: FLCH SPD Selected

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Final Approach: A/T in HOLD mode

777 AT Wake-up

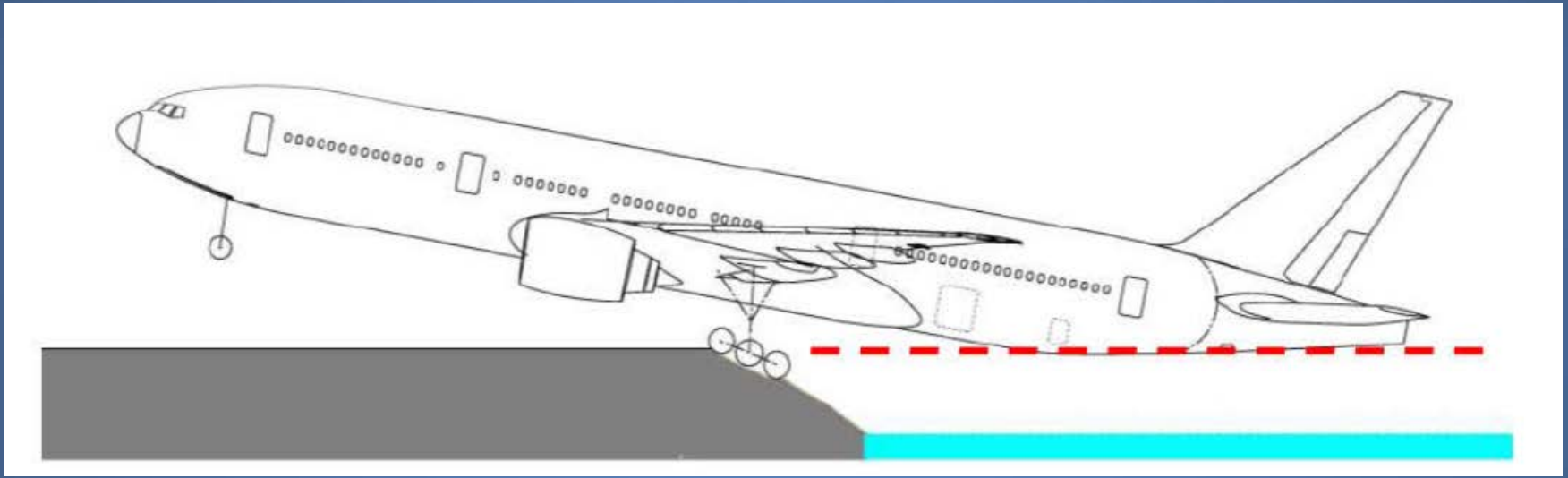
- If the autothrottles are disconnected, if speed gets too slow, the autothrottles will reactivate (“wake up”) and increase speed.
- If autothrottles are armed in their normal operating mode, but in HOLD mode, if speed gets slow, the autothrottles will not wake up.

Final Approach

- Flight passed through a 3° glidepath at about 500 feet
- Stabilized approach criteria not met
- Descent rate 1,200 fpm, throttles remained at idle

Final Approach

- PM – “speed” at 90 ft and 110 knots
- PM – added go-around thrust
- Column full aft
- Stick shaker activated
- Airplane did not have the performance to go around at that point



Estimated aircraft position at impact with seawall

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The Big Question

How could an airline crew crash an airplane on a perfectly clear day with calm winds on a visual approach?

Some Answers

- Poor monitoring due to expectancy, increased workload, fatigue, and automation reliance
- Complexities in the 777 automation and inadequacies in related training and documentation
  - Led to PF's inadvertent deactivation of automatic airspeed control

Autothrottle failing to wake up

- August 2010 - 787 certification test flight.
  - FAA test pilot noted concern
  - Autothrottle behavior “less than desirable”

Autothrottle failing to wake up - EASA Concerns -

- “although the … ‘Autothrottle wake up’ feature is not required per certification requirements, these two exceptions look from a pilot’s perspective as an inconsistency in the automation behavior of the airplane.”

- “the manufacturer would enhance the safety of the product by avoiding exceptions in the ‘Autothrottle wake up’ mode condition.”

Autothrottle failing to wake up

Addition to 787 Manual

During a descent in FLCH mode or VNAV SPD mode, the A/T may activate in HOLD mode. When in HOLD mode, the A/T will not wake up even during large deviations from target speed and does not support stall protection.

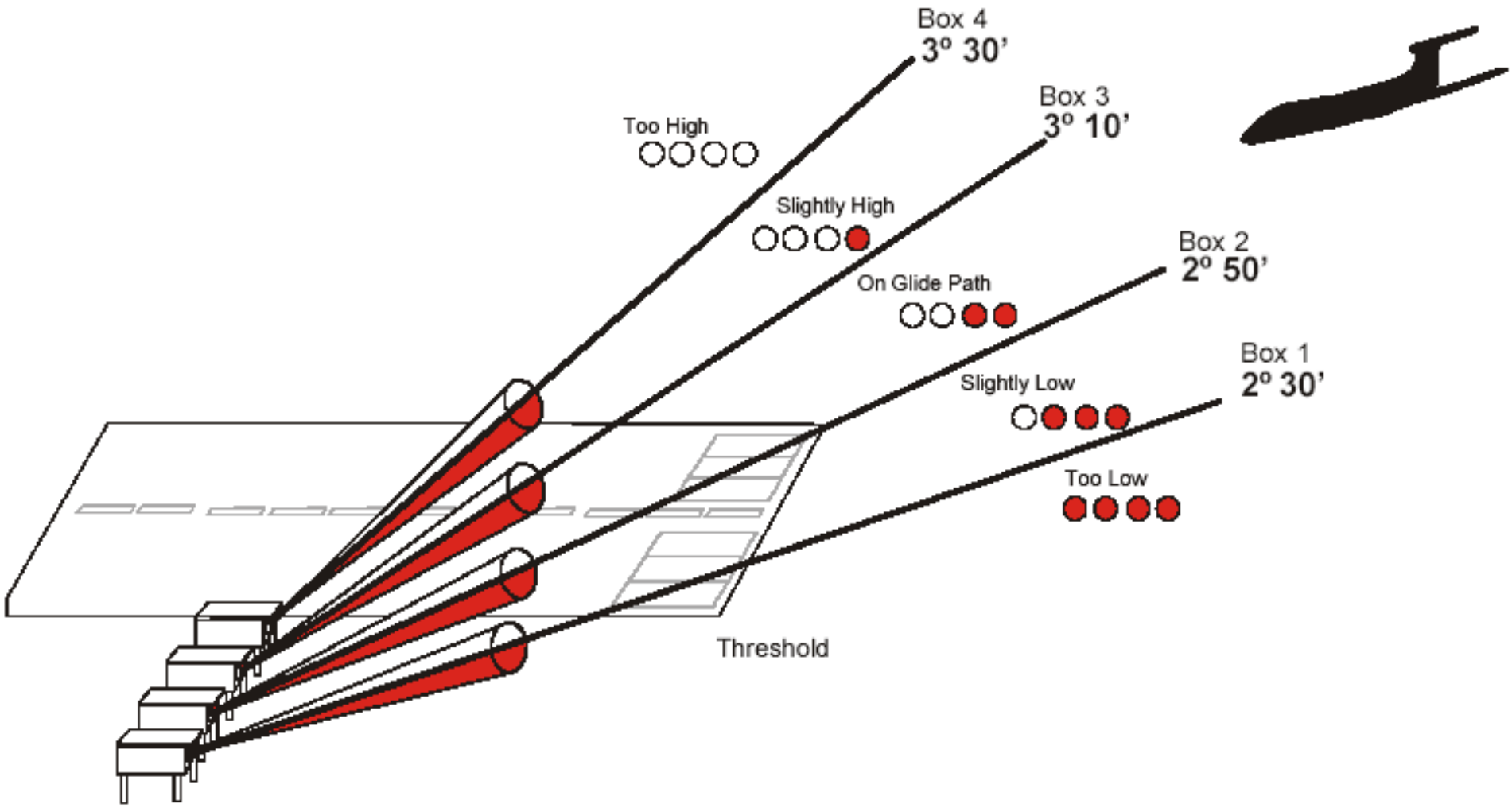
Addition to 777 Manual

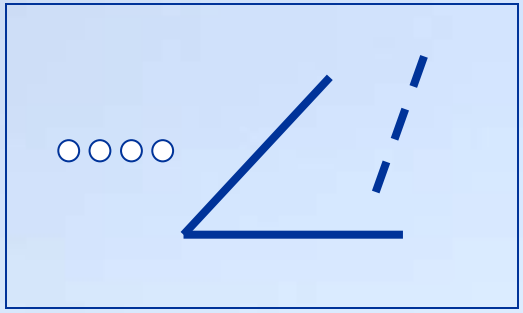
Autothrottle failing to wake up

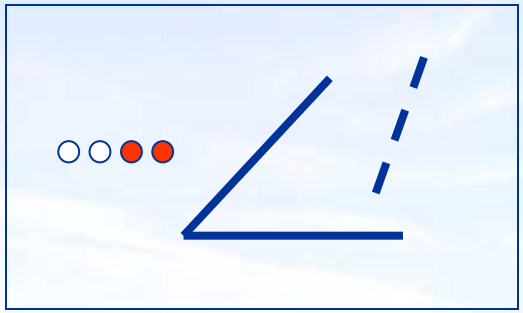
- PF's ground instructor
  - "anomaly"
  - Happened to him 3 times

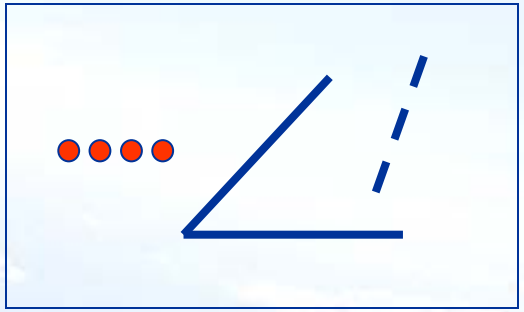
NTSB Finding

"If the autothrottle automatic engagement function ("wakeup"), or a system with similar functionality, had been available during the final approach, it would likely have activated and increased power about 20 seconds before impact, which may have prevented the accident."

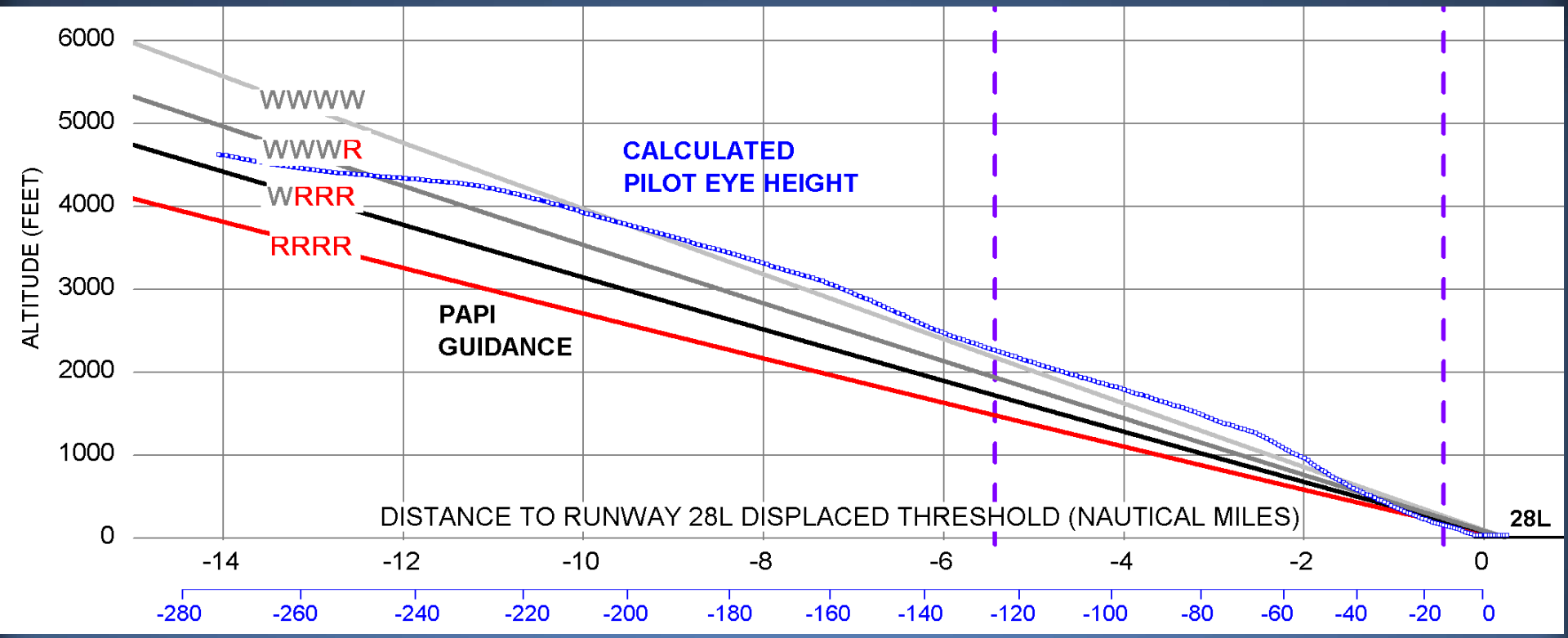

Box 4
3º 30'
Box 3
3º 10'
Too High
Slightly High
Box 2
2º 50'
On Glide Path
Box 1
2º 30'
Slightly Low
Too Low
Threshold







Profile View of Approach



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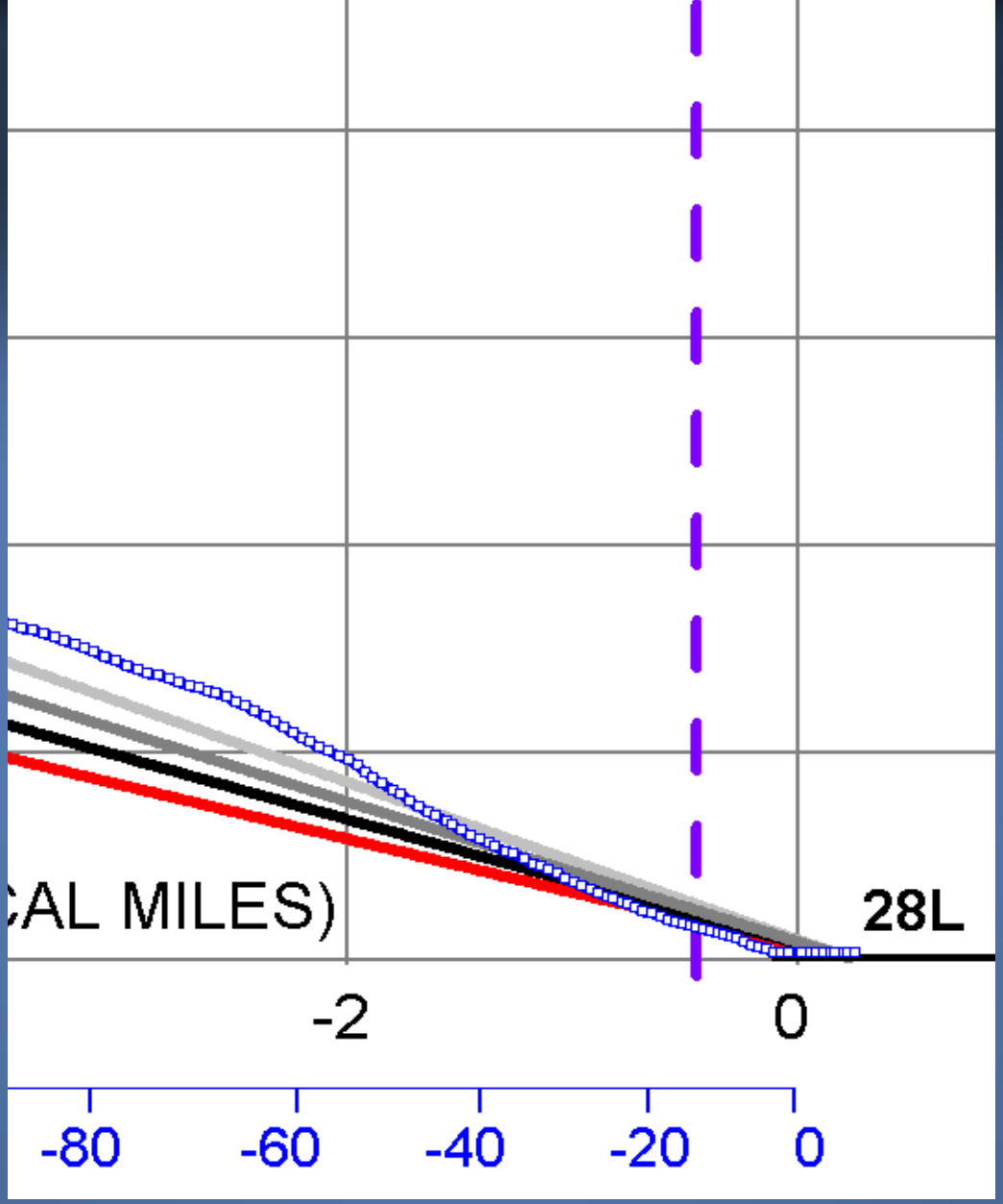
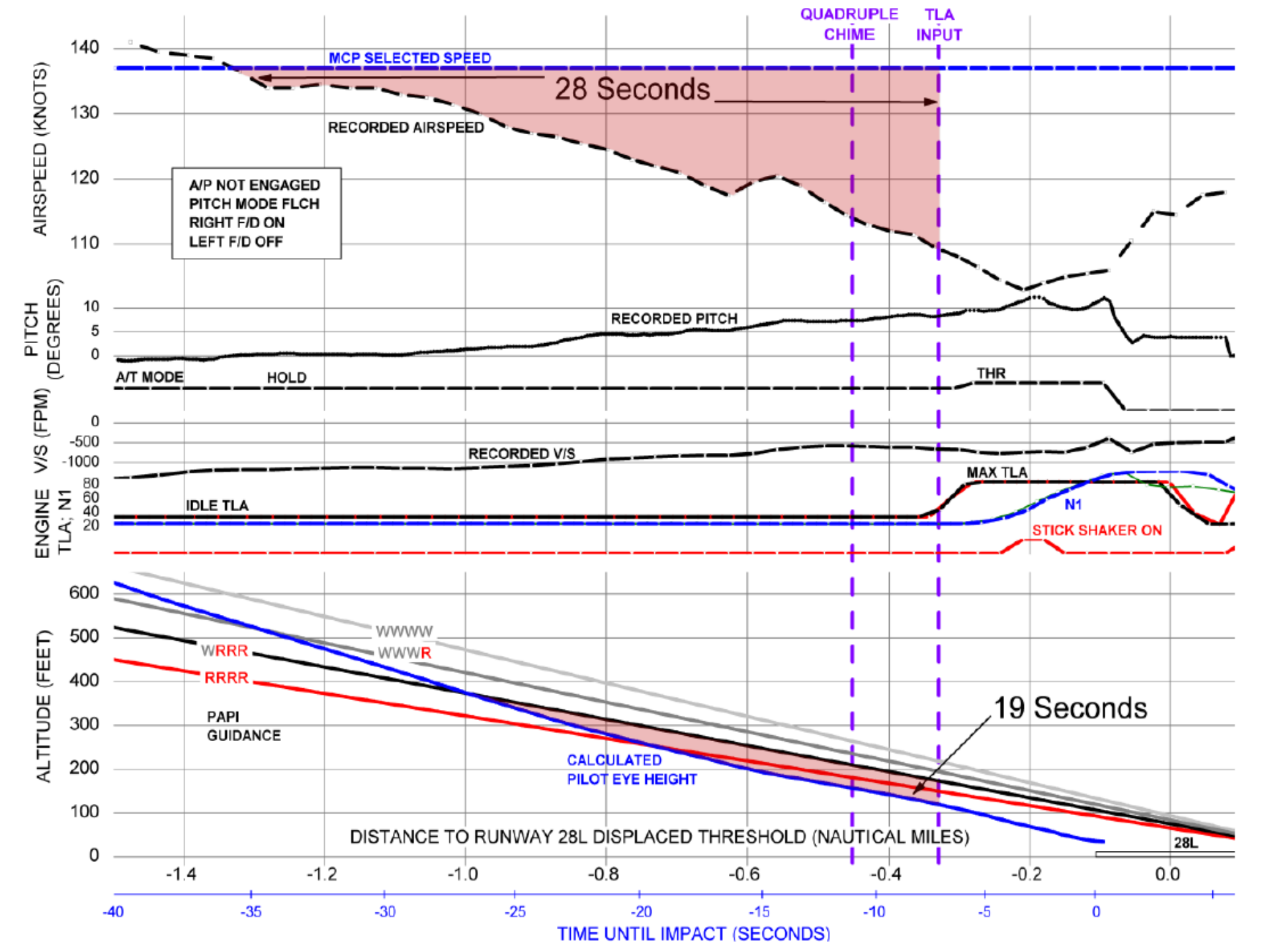
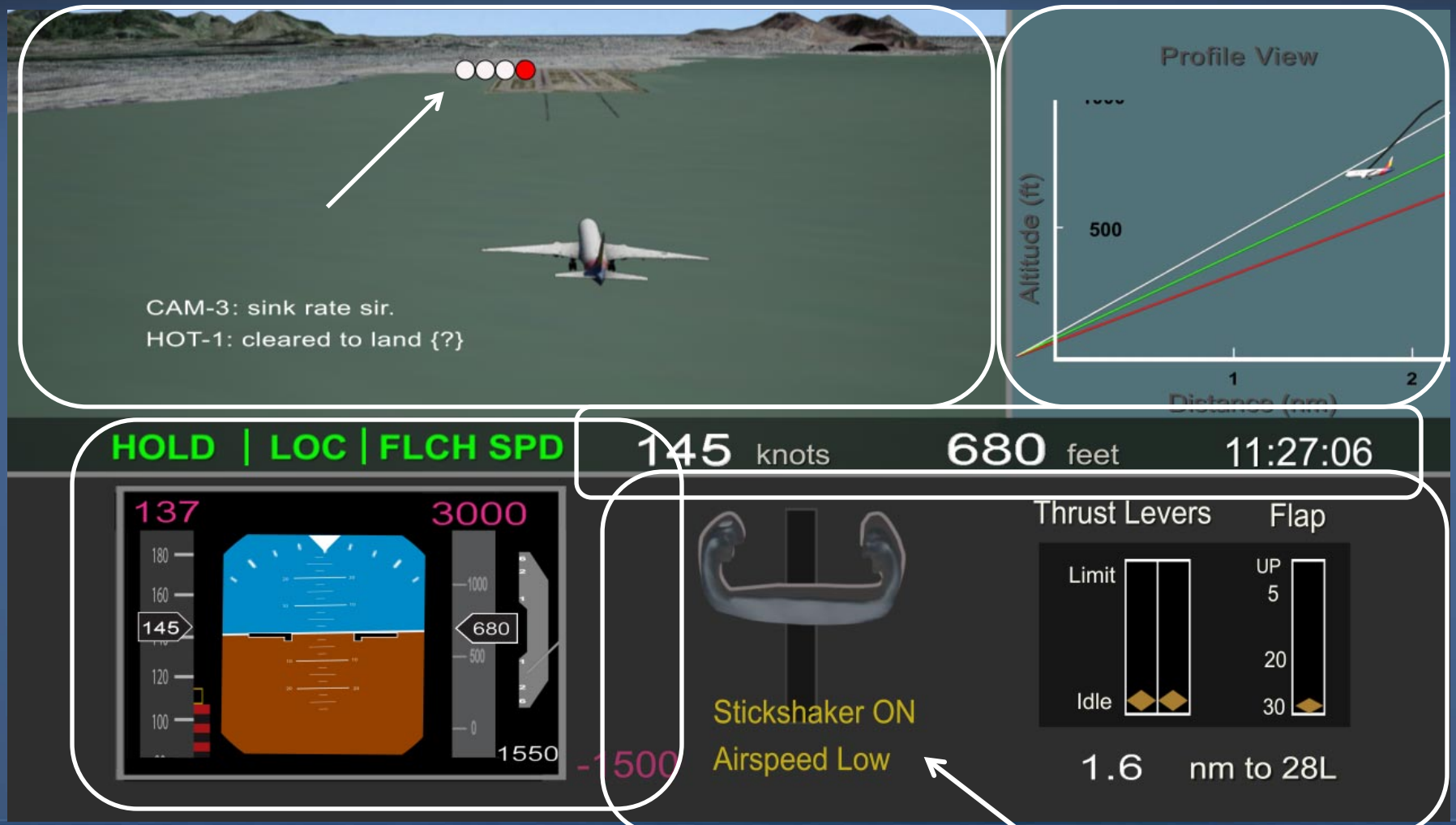

CAL MILES)
28L
-2
0
-80
-60
-40
-20
0


QUADRUPLE CHIME
TLA INPUT
AIRSPEED (KNOTS)
MCP SELECTED SPEED
28 Seconds
RECORDED AIRSPEED
A/P NOT ENGAGED
PITCH MODE FLCH
RIGHT F/D ON
LEFT F/D OFF
PITCH (DEGREES)
RECORDED PITCH
A/T MODE
HOLD
THR
V/S (FPM)
RECORDED V/S
ENGINE TLA; N1
IDLE TLA
MAX TLA
N1
STICK SHAKER ON
ALTITUDE (FEET)
WWWW
WWWR
WRRR
RRRR
PAPI GUIDANCE
CALCULATED PILOT EYE HEIGHT
19 Seconds
DISTANCE TO RUNWAY 28L DISPLACED THRESHOLD (NAUTICAL MILES)
28L
TIME UNTIL IMPACT (SECONDS)

Animation Items



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Descent Below Visual Glidepath and Impact with Seawall

Asiana Airlines Flight 214
Boeing 777-200ER, HL7742
San Francisco, California
July 6, 2013
DCA13MA120

National Transportation Safety Board

Descent Below Visual Glidepath and Impact with Seawall

Asiana Airlines Flight 214
Boeing 777-200ER, HL7742
San Francisco, California
July 6, 2013
DCA13MA120

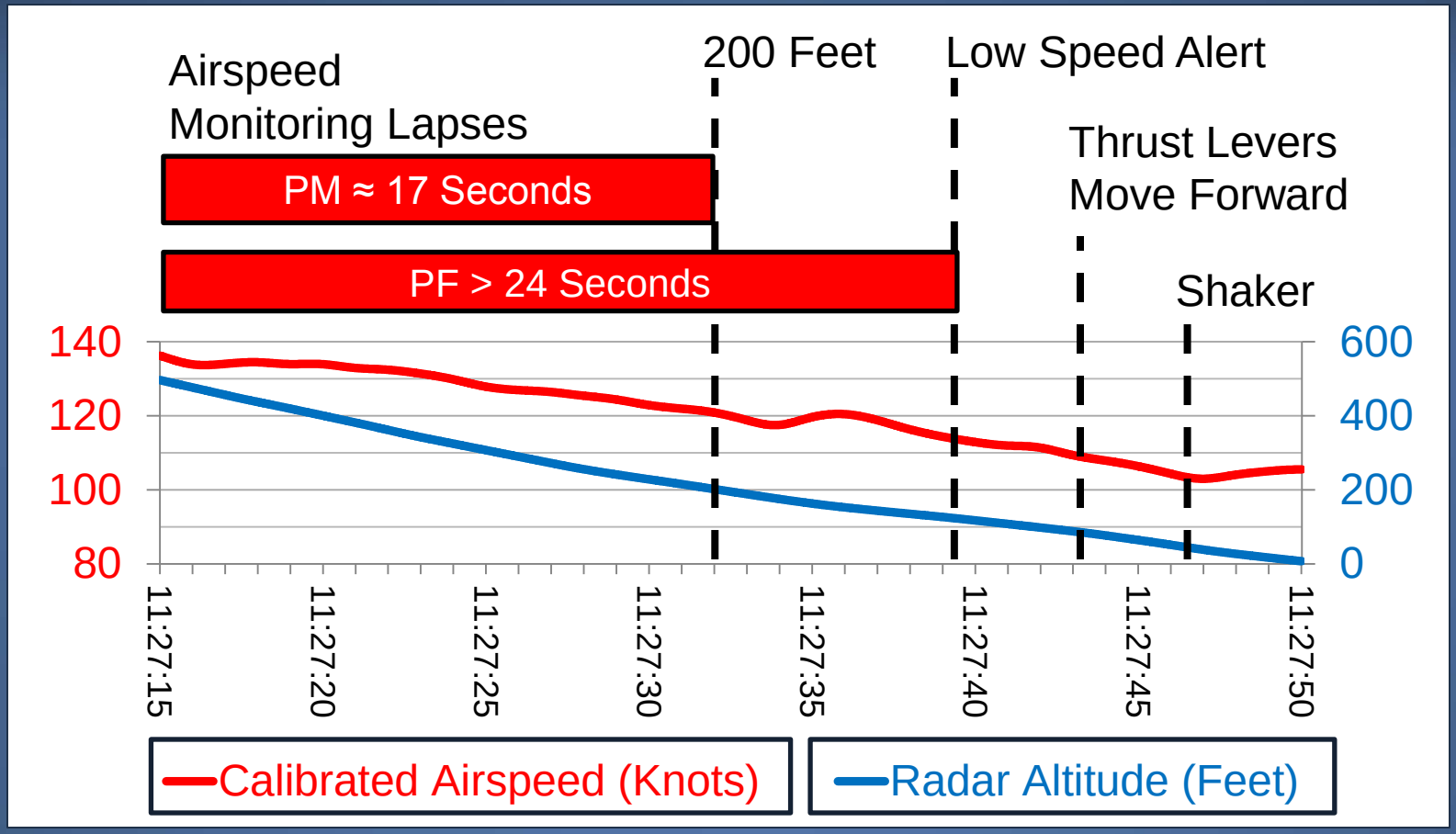
Safety Issues

- Flightpath management
- Adherence to standard operating procedures
- Flight crew monitoring
- Flight instructor operating experience proficiency
- Manual flight proficiency
- Understanding of autothrottle system logic

Safety Issues

- B777 autoflight system airspeed control
- Appropriate use of flight directors
- Low energy alerting systems
- Injury potential from lateral forces
- Slide/raft certification standards
- ARFF training and staffing
- San Francisco Airport emergency procedures

Monitoring


Airspeed
Monitoring Lapses
200 Feet
Low Speed Alert
Thrust Levers
Move Forward
PM ≈ 17 Seconds
PF > 24 Seconds
Shaker
140
120
100
80
600
400
200
0
11:27:15
11:27:20
11:27:25
11:27:30
11:27:35
11:27:40
11:27:45
11:27:50
Calibrated Airspeed (Knots)
Radar Altitude (Feet)

NTSB Finding

“Insufficient flight crew monitoring of airspeed indications during the approach likely resulted from expectancy, increased workload, fatigue, and automation reliance.”

NTSB Finding

"A context-dependent low energy alert would help pilots successfully recover from unexpected low energy situations like the situation encountered by the accident pilots."

Probable Cause

- 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
- The flight crew's delayed execution of a go-around after they became aware that the airplane was below acceptable glidepath and airspeed tolerances.

Contributing to the accident:

(1) the complexities of the autothrottle and autopilot flight director systems that were inadequately described in Boeing's documentation and Asiana's pilot training, which increased the likelihood of mode error

(2) the flight crew's nonstandard communication and coordination regarding the use of the autothrottle and autopilot flight director systems

(3) the pilot flying's inadequate training on the planning and executing of visual approaches

(4) the pilot monitoring/instructor pilot's inadequate supervision of the pilot flying

(5) flight crew fatigue which likely degraded their performance.

27 Recommendations

- FAA (15)
- Asiana Airlines (4)
- Boeing (2)
- ARFF Working Group (4)
- City of San Francisco (2)

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