



**NTSB** National Transportation Safety Board

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# Human Factors in Helicopter Accidents

Robert Sumwalt  
NTSB Board Member



- General Aviation safety
- Runway safety
- SMS
- Recorders
- Human fatigue
- Pilot and controller professionalism
- Bus occupant safety
- Teen driver safety
- Alcohol-impaired driving
- Motorcycle safety

**Critical changes needed to reduce transportation accidents and save lives.**

**Human Factors:  
It's not just all about humans,  
you know.**

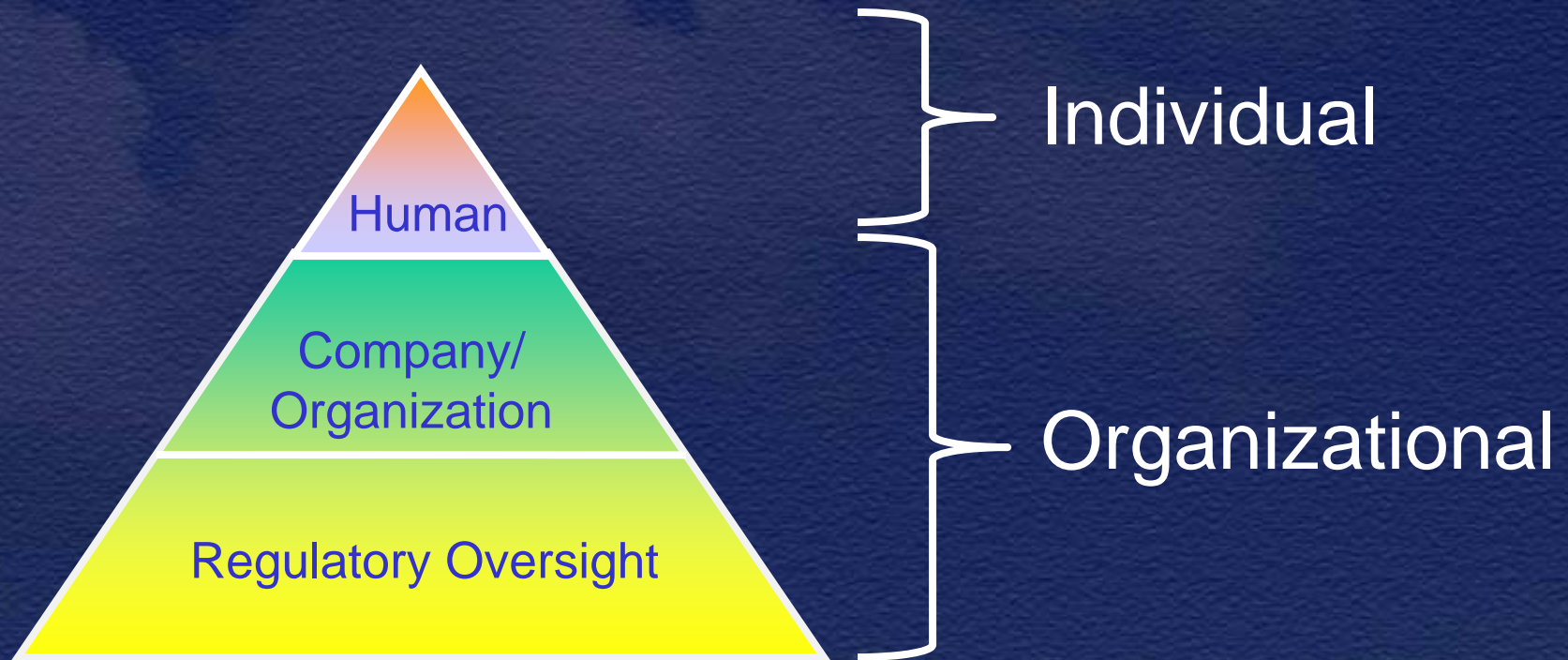


The Human

Organizational  
Influence

Regulatory Influence

# Systems Approach



**Focusing on the individual = minimal safety improvements.**  
**Focusing on entire system = greatest potential for safety improvements.**

**Case study:  
Accident involving  
New Mexico State Police**

# History of Flight



- June 9, 2009
- 2135 mountain daylight time
- Agusta A-109E
- Public search and rescue
- Near Santa Fe, NM
- Pilot and passenger killed
  - spotter seriously injured

# Timeline of Events

Time	Activity
0700 -1500	Pilot works 8 hour shift, including 3 flights
1756	Dispatch asks if pilot felt “like going up again” for this SAR
1850	Takes off from Santa Fe airport
	Searches for hiker for more than 1 hour
2010	Spots hiker, no where too close to land
2019	Sunset
2030	Lands on mountain top
2035	Pilot sets out looking for hiker
2049	End of civil twilight
2124	Pilot returns, carrying hiker
2132:48	First radar returns from helicopter
2135:25	Last radar return







**Santa Fe**

**SAR base**

**Hiker**

**LZ**

**Wreckage**

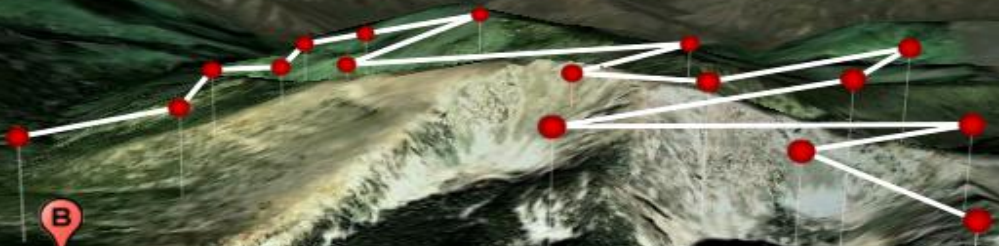


Image © 2011 DigitalGlobe

Image NMRGIS

Image U.S. Geological Survey

Image USDA Farm Service Agency

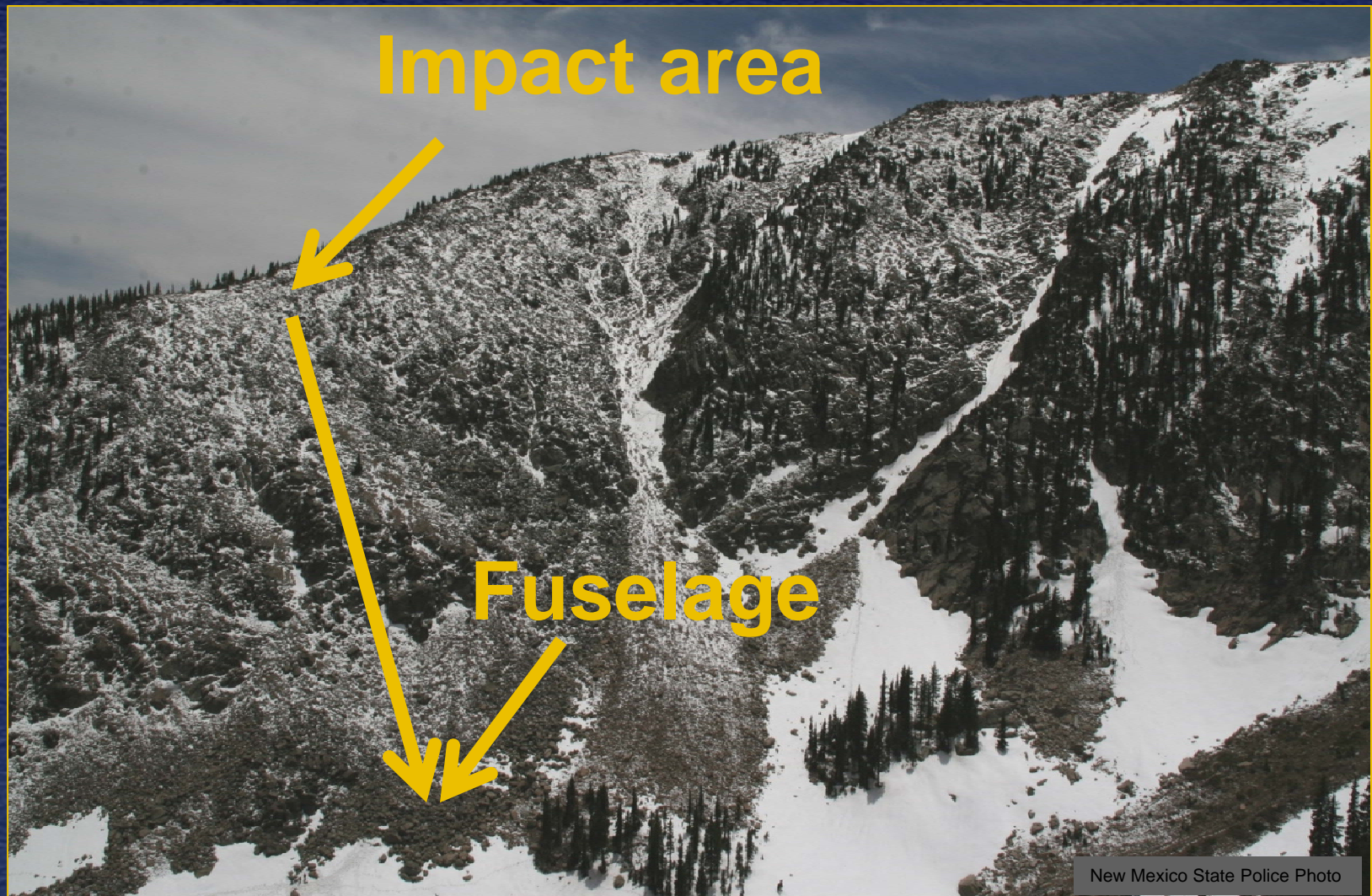
35° 49.053' N 105° 50.089' W elev 9331 ft

©2010 Google

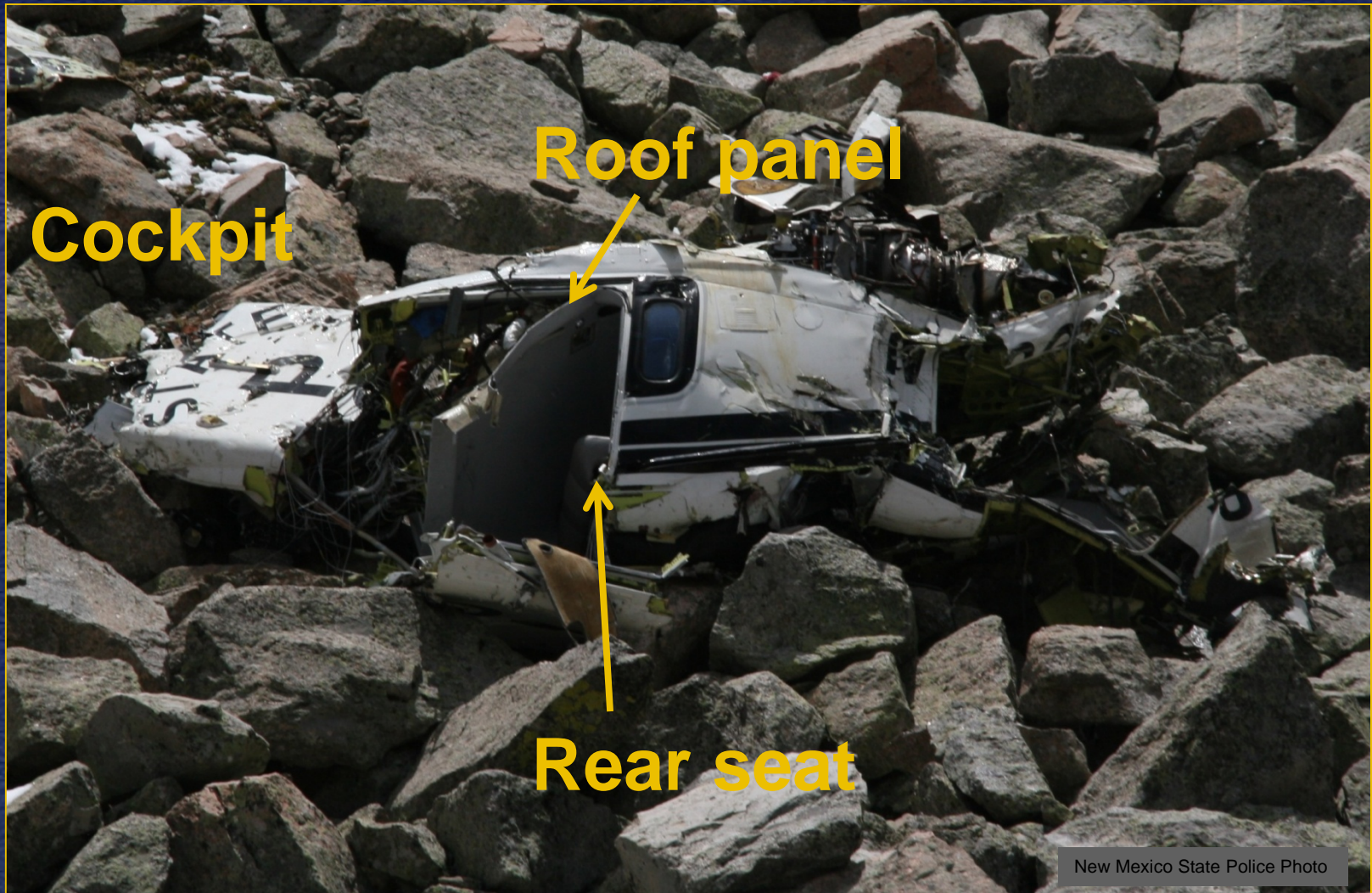
Eye alt 17228 ft

Imagery Dates: Aug 7, 2003 - Nov 24, 2009

# History of Flight



# Fuselage



# NTSB Probable Cause:

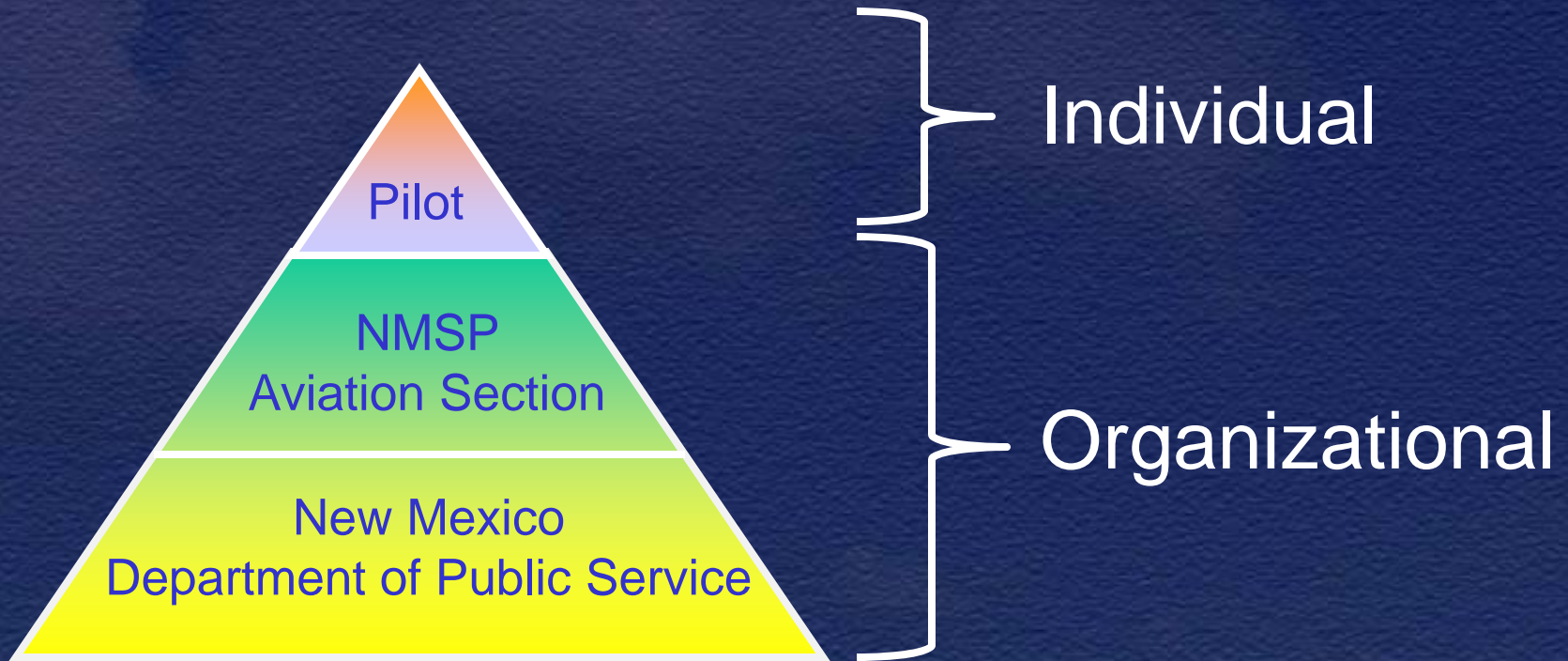
- The pilot's decision to take off from a remote, mountainous landing site in dark (moonless) night, windy, instrument meteorological conditions.
- Contributing to the accident were an organizational culture that prioritized mission execution over aviation safety, and
- the pilot's fatigue, self-induced pressure to conduct the flight, and situational stress.

(Continued)

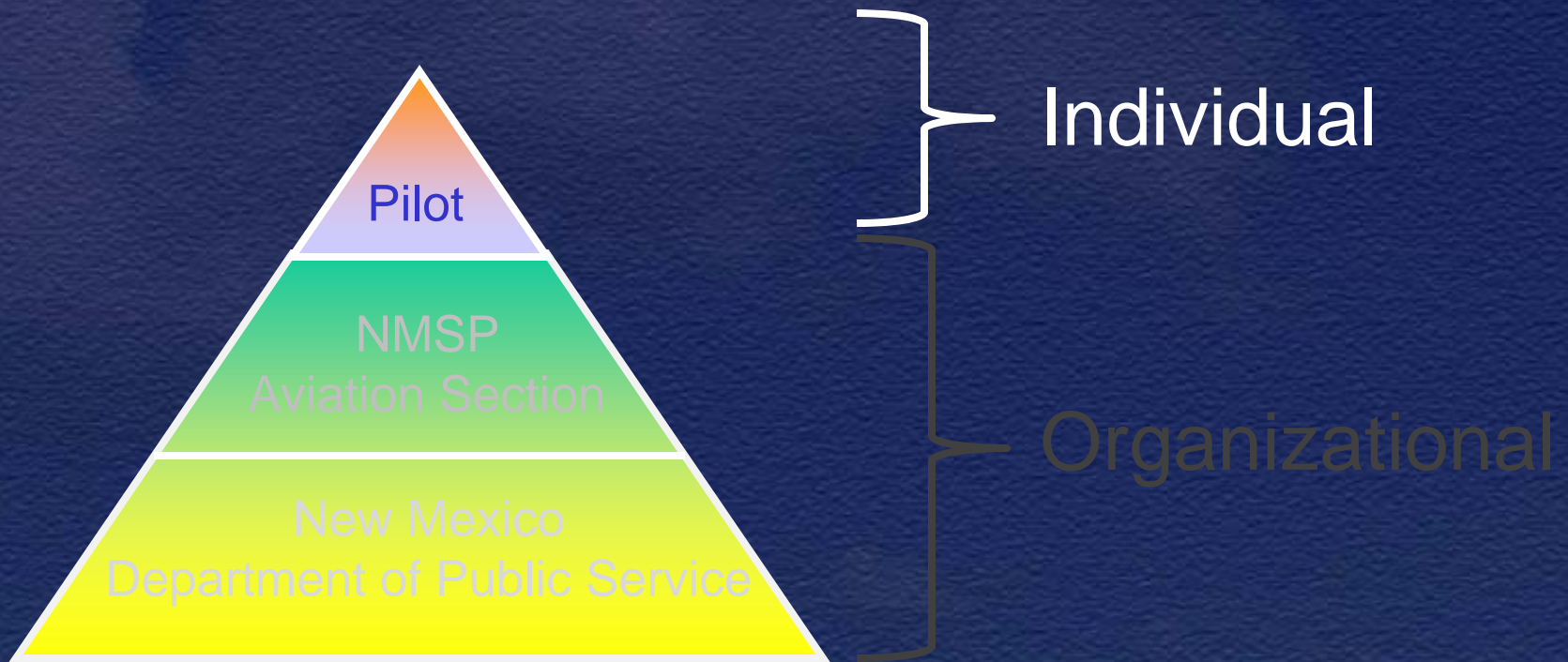
# Also Contributing to the Accident

- Deficiencies in the NMSP aviation section's safety-related policies, including:
  - lack of a requirement for a risk assessment at any point during the mission
  - inadequate pilot staffing
  - lack of an effective fatigue management program for pilots
  - and inadequate procedures and equipment to ensure effective communication between airborne and ground personnel during search and rescue missions.

# A “Systems Accident”



# A “Systems Accident”



# The Accident Pilot

- Hired by NMSP as patrol officer (1995)
- Transferred to NMSP academy
  - Became lead instructor for special weapons assault team
- Transferred to aviation section, began pilot training (2002)
- Assigned additional duties as NMSP public information officer (2007)
- Promoted to chief pilot (Jan 2009), in addition to his other duties



# What Others Said

- “very skilled manipulator of the controls”
- “very aggressive, high speed type”
- “would go 100 miles an hour all the time”
- “very heroic type of person” who disliked turning down missions
- told his supervisor that the aviation section would no longer turn down missions without going up to “take a look”
- was the kind of person who was willing to put himself at risk to save others
- tended to “act right away before thinking things out”

Day	Time	Activity
Saturday, June 6		Worked with media throughout the day.
		Flew helicopter to public event for static display
	2120	Call to news organization
	2200	Went to bed

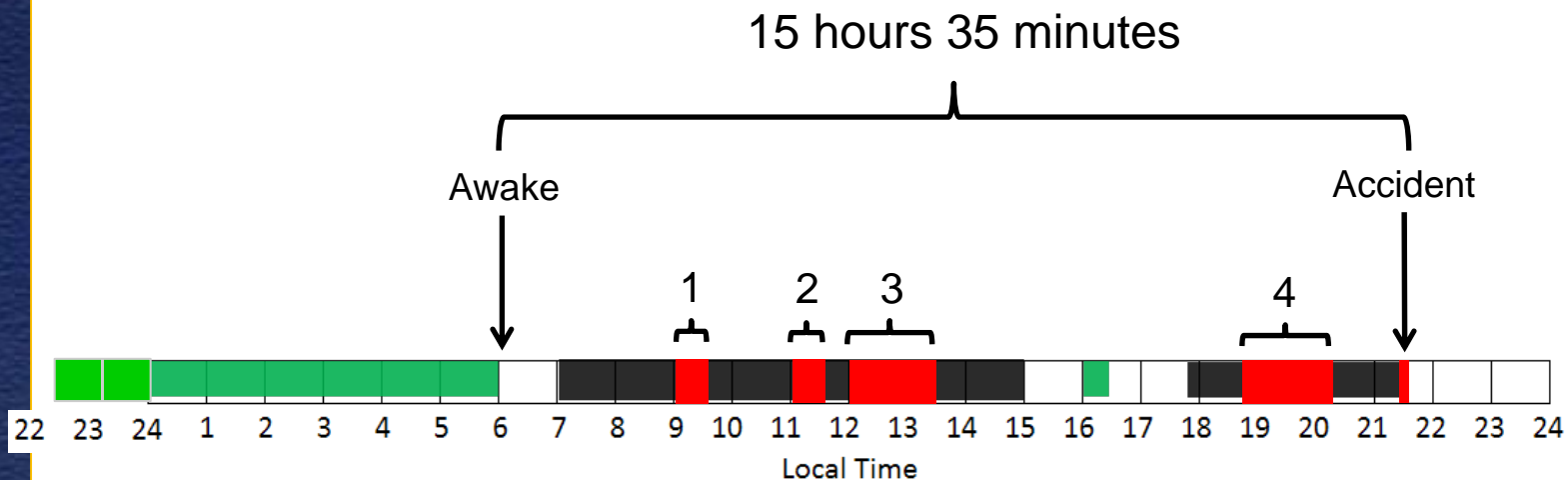
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Sunday June 7	0035	Received work-related phone call
	0700	Woke up
		Worked with media throughout the day
	2200	Went to bed
	2330 - midnight	Received work-related phone calls

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		Worked with media throughout the day
	2200	Went to bed
	2330 - midnight	Received work-related phone calls
Monday, June 8	0245 - 0300	Received work-related phone calls
	0300	Began duty day
	0400-0500	Flew missions
	0630 - 0800	Flew missions
	2200	Went to bed

# Day of Accident

- Sleep opportunity
- Work activity
- Flights

- Hours worked: 11 hours 41 minutes
- Time in the air: 5 hours 22 minutes
- Prior flights: 4



# Protected Rest

## FAA definition

§ 14 *CFR* 91.1057

“A period of time ...that is free of all responsibility for work or duty prior to the commencement of, or following completion of, a duty period, and during which the flight crewmember ... cannot be required to receive contact from the program manager. A rest period does not include any time during which the program manager imposes on a flight crewmember ... any duty or restraint, including any actual work or present responsibility for work should the occasion arise.”

## Robert's definition

Simply that rest period time that a flight crewmember cannot be assigned additional duties, or even called, for that matter.

# Weather (as reported by helicopter spotter)

## Santa Fe Airport (6348 msl)

- “Warm and sunny” when they departed

## Landing Zone (11,600 msl)

- Upon landing - strong, cold western winds and beginning to sleet
- After pilot left to find hiker - got windier and began “sleeting like crazy.”
- Almost immediately after takeoff – in clouds, “zero visibility,” very turbulent

# Situational Stress

2015: After locating the hiker, dispatcher asks if he can land on top of hill and send spotter to retrieve hiker:

“That’s about the only thing we’re going to be able to do.”

2033: Before getting out of the helicopter to find hiker:

“It’s going to start snowing up here and if it does that, I’ve got to get the \* out of here.”

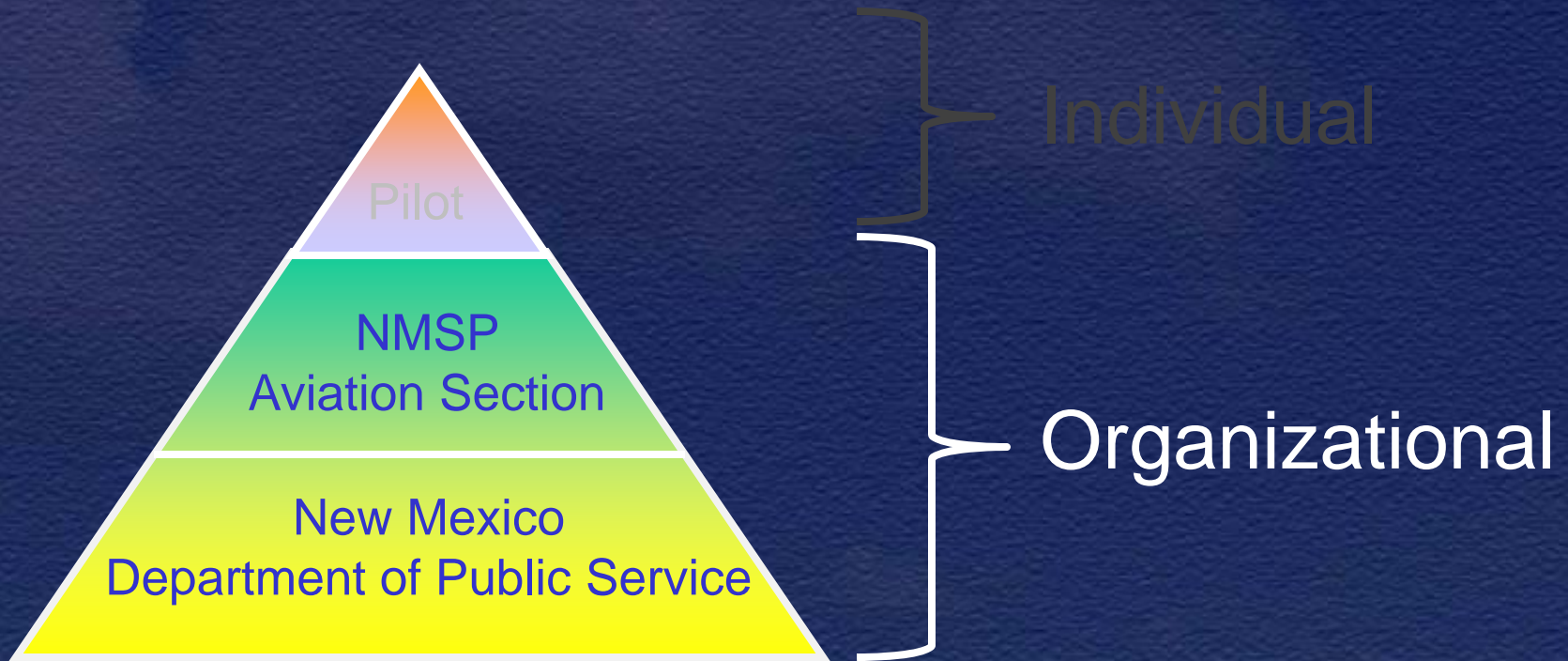
“I’m not going to spend a lot of time or we’re going to have two search and rescues.”



# NTSB Finding

- “The pilot decided to take off from the remote landing site, despite mounting evidence indicating that the deteriorating weather made an immediate return to Santa Fe inadvisable, because his fatigue, self-induced pressure to complete the mission, and situational stress distracted him from identifying and evaluating alternative courses of action.”

# A “Systems Accident”



# Pilot Training

- Fixed-wing instrument rating
- No helicopter instrument rating
- No helicopter inadvertent IMC training
- Helicopter inadvertent IMC training could improve safety

# No Requirement for Preflight Risk Assessment

- Risk factors
  - High altitude
  - Mountainous terrain
  - < 2 hours of daylight
- Precautions (not taken)
  - Warm clothing
  - Night vision goggles

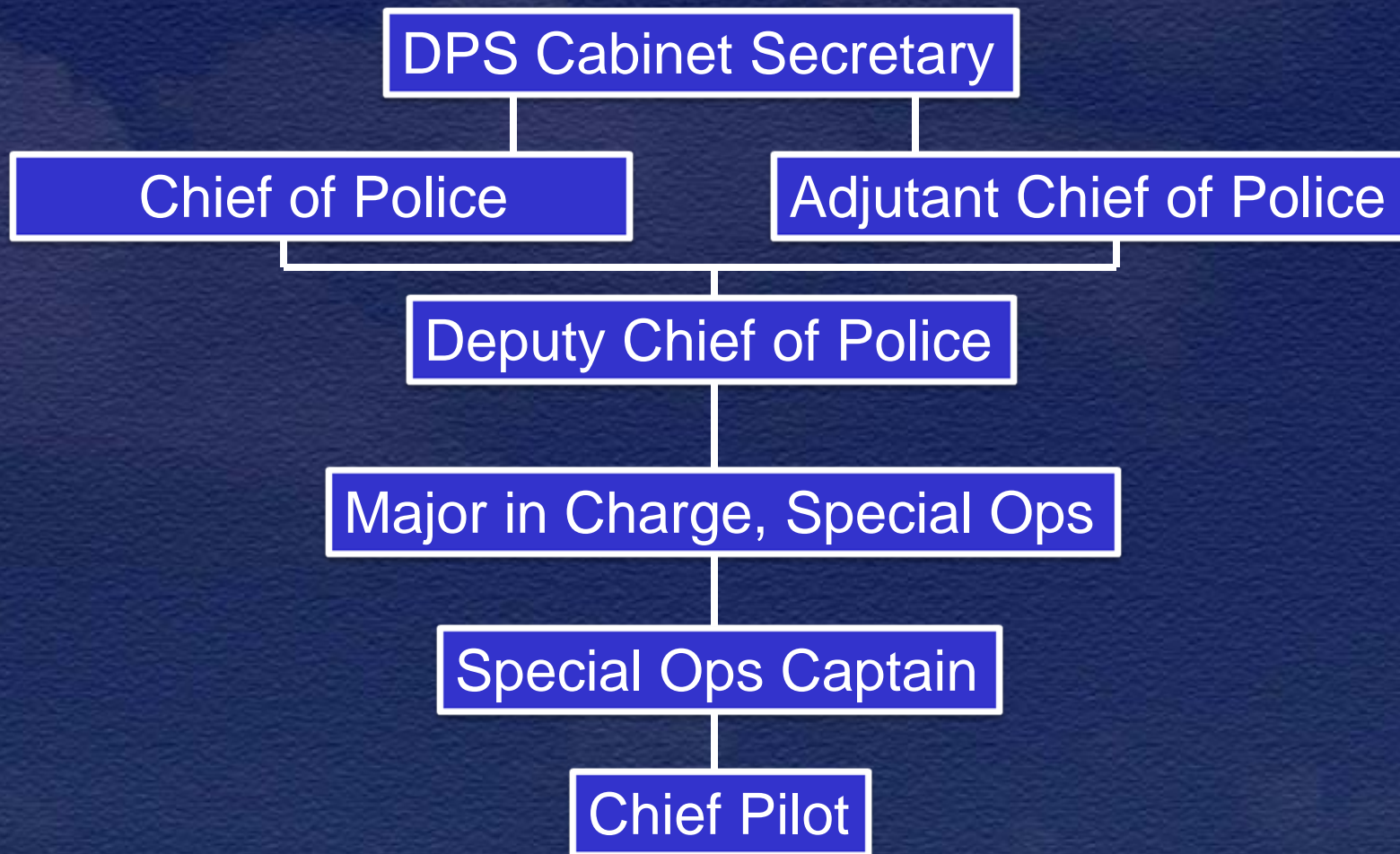
# NTSB Finding

“If operators of public aircraft implemented structured, task-specific risk assessment and management programs, their pilots would be more likely to thoroughly identify, and make efforts to mitigate, the potential risks associated with a mission.”

# NTSB Finding - Staffing

- NMSP was insufficiently staffed to allow helicopter operations 24/7 without creating an unacceptable risk of pilot fatigue.

# NMSP Reporting Structure



# DPS Cabinet Secretary

- Former military pilot – fixed and rotor wing
- Had formerly been a NMSP chief pilot
- Liked to be involved with aviation section, but did not ensure it had an effective safety program
  - Wrote memo saying that accident pilot was authorized to operate the accident helicopter, including SAR missions below 9000 feet msl.
- Took actions that were detrimental to safety
  - Dismissed former chief pilot for tuning down missions
  - Demanded explanations whenever a pilot declined a SAR mission
  - Complained vigorously when New Mexico National Guard pilots launched when NMSP declined
  - Would ask NMSP pilots to continue checking the weather when they had already declined mission due to weather





# NTSB Finding

“Although there was no evidence of any direct NMSP or DPS management pressure on the pilot during the accident mission, there was evidence of management actions that emphasized accepting all missions, without adequate regard for conditions, which was not consistent with a safety-focused organizational safety culture, as emphasized in current safety management system guidance.”

# Recommendations

- As a result of the investigation, NTSB issued 16 recommendations:
  - 4 to ALEA
  - 4 to Governor of New Mexico
  - 4 to National Association of State Aviation Officials (NASAO)
  - 4 to International Association of Chiefs of Police

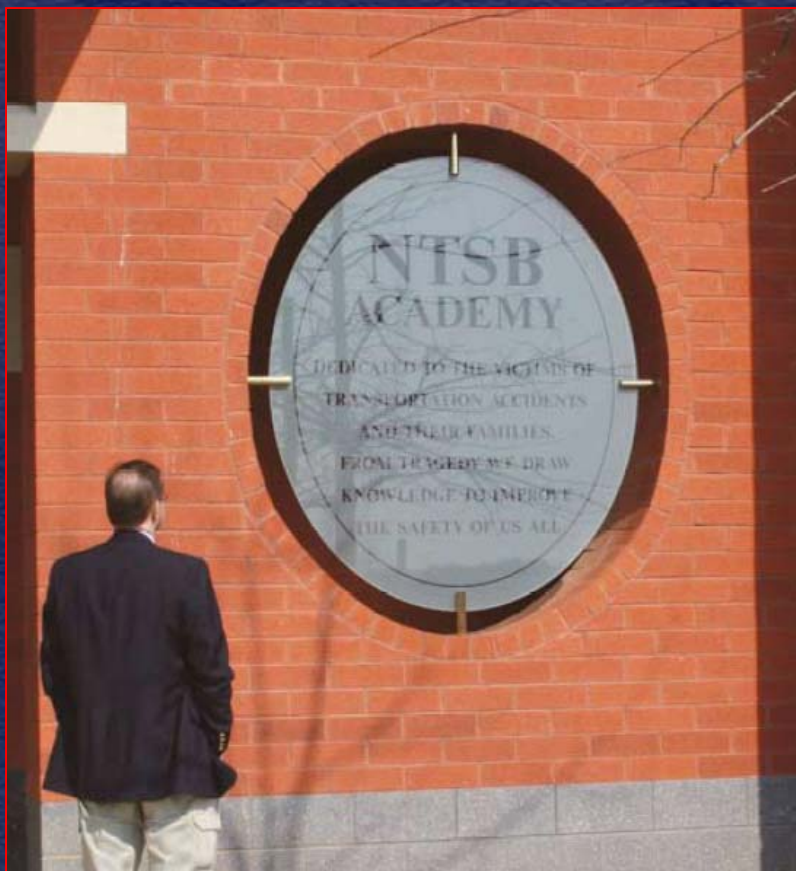
# NTSB Recommendations to ALEA

- “Revise your standards to define pilot rest and ensure that pilots receive protected rest periods that are sufficient to minimize the likelihood of pilot fatigue during aviation operations.”
- “Revise your accreditation standards to require that all pilots receive training in methods for safely exiting inadvertently encountered IMC for all aircraft categories in which they operate.”



# NTSB Recommendations to ALEA

- “Encourage members to install 406-megahertz ELTs on all of their aircraft.”
- “Encourage your members to install flight-tracking equipment on all public aircraft that would allow for near-continuous flight tracking during missions.”



“From tragedy we draw knowledge to improve the safety of us all.”



**NTSB**

