

# Threat and Error Management

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# Introducing Threat and Error Management

(generic intro to subject)

# Terminology

**Threat** Environmental or systemic hazards that undermine reliability or safety

**Error** Human operational mistake that undermines reliability or safety

**Active** Having an immediate effect

**Latent** Having a hidden, non-obvious effect

Errors and threats can be active or latent.

# Deadly Combination

Active errors paired with latent threats:

- ▶ Unexpected behavior
- ▶ Undermines situational awareness
- ▶ Leading to more confusion
- ▶ Leading to further error

# Case Study: Three Mile Island

## Latent Threats

- ▶ Complex monitoring
- ▶ Alert printer capacity
- ▶ Potential for solenoid monitoring to misrepresent state

## Latent Errors

- ▶ Nonstandard maintenance of filters

## Active Errors

- ▶ Failure to open relief valves
- ▶ Failure to supply extra cooling to main containment vessel

# Case Study: Piper Alpha

## Latent Threats

- ▶ Rubber mats under natural gas pipeline
- ▶ Safety valve on different floor than pump
- ▶ Poor SOPs
- ▶ No fire/safety training
- ▶ Any others?

## Active Errors

- ▶ Switching on the condensate pump

# Case Study: Deepwater Horizon

## Latent Threats

- ▶ Tight schedule
- ▶ Removal of mud during pumping
- ▶ Unstable rock formation
- ▶ Lots of contractors/coordination difficulty

## Latent Errors

- ▶ Transitioning test well to production

## Active Error

- ▶ Continuing to pump in mud despite getting more out than they were putting in.

# Case Study: Tenerife

## Latent Threats

- ▶ Power distance in cockpit
- ▶ Time pressure and rest periods
- ▶ Aircraft taxiing down runway
- ▶ Negative Training
- ▶ Fog limiting visibility in runway

## Active Threats

- ▶ Weather near limits

## Active Error

- ▶ Taking off without clearance



# The Accident Cone



- ▶ Safe Operations
- ▶ Threats but no errors yet
- ▶ Threats plus errors
- ▶ Undesired (aircraft) states

# Exercise

Common threats in software operations (w/flip board)

# Open Discussion

Threat and Error Management