

Generic Safety

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High Reliability Organization

- Any group of people and machines assembled to meet an objective and requires high reliability of all parts to prevent a high consequence, low probability accident
- May be any size



USS Kittyhawk

Other Examples



Organization Activities

Management	Maintenance	Training
Procedures	Operations	Design
Design Control	Human Factors	Regulations

What Causes High Percentage of Accidents

- Fatigue combined with the unexpected
- Owner maintenance and design changes
- Failure to maintain situational awareness
- Lack of practice/recurrent training
- Failure to understand root cause of other accidents and apply lessons learned
- Failure to diagnose and recover from an accident in progress

Causes Continued

- No plan
- Not recognizing traps set inadvertently by or through the ignorance of others
- Concern for political or financial forces, group think
- Distractions at critical times and/or unproductive efforts
- Physical impairment such as hypoxia and dehydration

Some Examples Outside Aviation



Chernobyl nuclear power station, Ukraine.
0.96.07.02.21 DEC 1995
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Chernobyl Accident Causes

- Politically appointed management
- Pressure on operator to complete test
- Plant construction not complete
- Operation outside plant operating limits during test
- Main safety system not operational
- Failure of operators to understand reactor physics to diagnose and stop accident
- Failure to use prescribed operating safety procedures to stop accident

Some more examples

- The Newhall incident
- The Soda can trap (glider examples)
- Aircraft design changes

Root Cause Analysis



- Prepare a time line of the accident
- Gather as much physical data as possible
- Interview survivors, witnesses and record results
- Place the data on the timeline and link the causes
- Determine the earliest cause that would have avoided the accident

Situational Awareness

- Be concerned and observant about what can happen next and have a plan
- When something is not quite right, ask yourself-what is wrong with this picture
- When things aren't going as planned, don't dither in changing the plan
- Four states of awareness

Planning



- Have a plan based on training, experience and objectives for most activities and follow it until there is a clear need to alter it
- Develop “Tape Loops”
- Tape loops solve most of the likely causes when there is no time for analysis
- Examples: Firearm stoppage, parachute procedure, engine power loss, first aid

Group Think

- Allowing a poor decision to be made based on an unchallenged suggestion
- Often accompanied by a desire to please the person making the suggestion for any reason
- Challenger accident



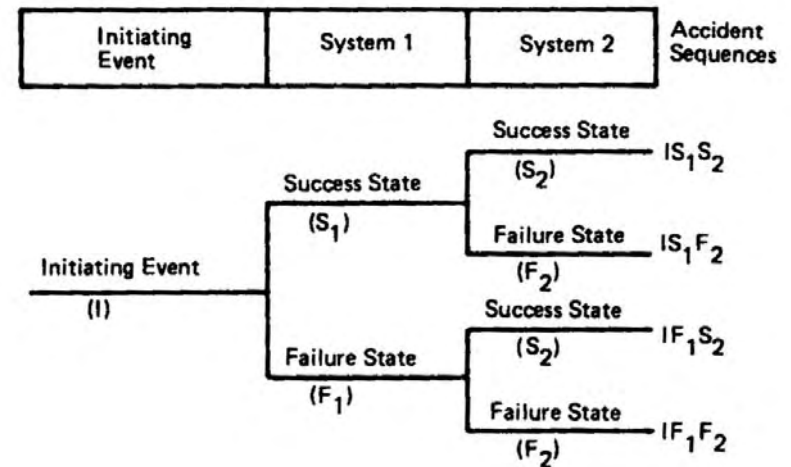
Safety Analysis



- How safe is safe?
- Risk must include probability and consequences
- An approach used more and more is PRA, Probabilistic Safety Analysis
- Requires an estimation of component and action probabilities based on failure statistics
- Reliability Centered Maintenance based on PRA developed to make B 747 economical

Example Event Tree

- Shows an accident initiating event and two systems required for successful recovery
- Individual probabilities are combined to compute probability of an accident from this initiating event
- Many trees must be combined for all initiators
- Every nuclear power plant has a PRA



Who Is Responsible

- You are responsible for your own safety
- The manager is responsible for the high reliability organization
- Don't be willingly ignorant, you are the quarterback

