

DoD Human Factors Analysis and Classification System



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Declining Mishap Rate

- **New safety initiatives introduced regularly.**
- **The rate of mishap reduction has slowed significantly and substantially during the last 10 years.**
- **This has led some to conclude that further reductions in accident rates are improbable, if not impossible.**

COSTS OF NAVAL ACCIDENTS



Direct Cost (FY 98 – 08)

- \$5.14 Billion and 1113 Lives



Indirect Cost

- Loss of Manpower
- Delay in Doing Business
- Corporate Reputation
- Investigation Costs
- Litigation

Thru 15 Apr 08

Source: U.S. Naval Safety Center

WHAT MUST WE DO?

- **Mishap reduction now calls for a new focus.**
- **Accident prevention measures must address the primary cause of accidents, which in most cases, is the human (ICAO, 1993).**

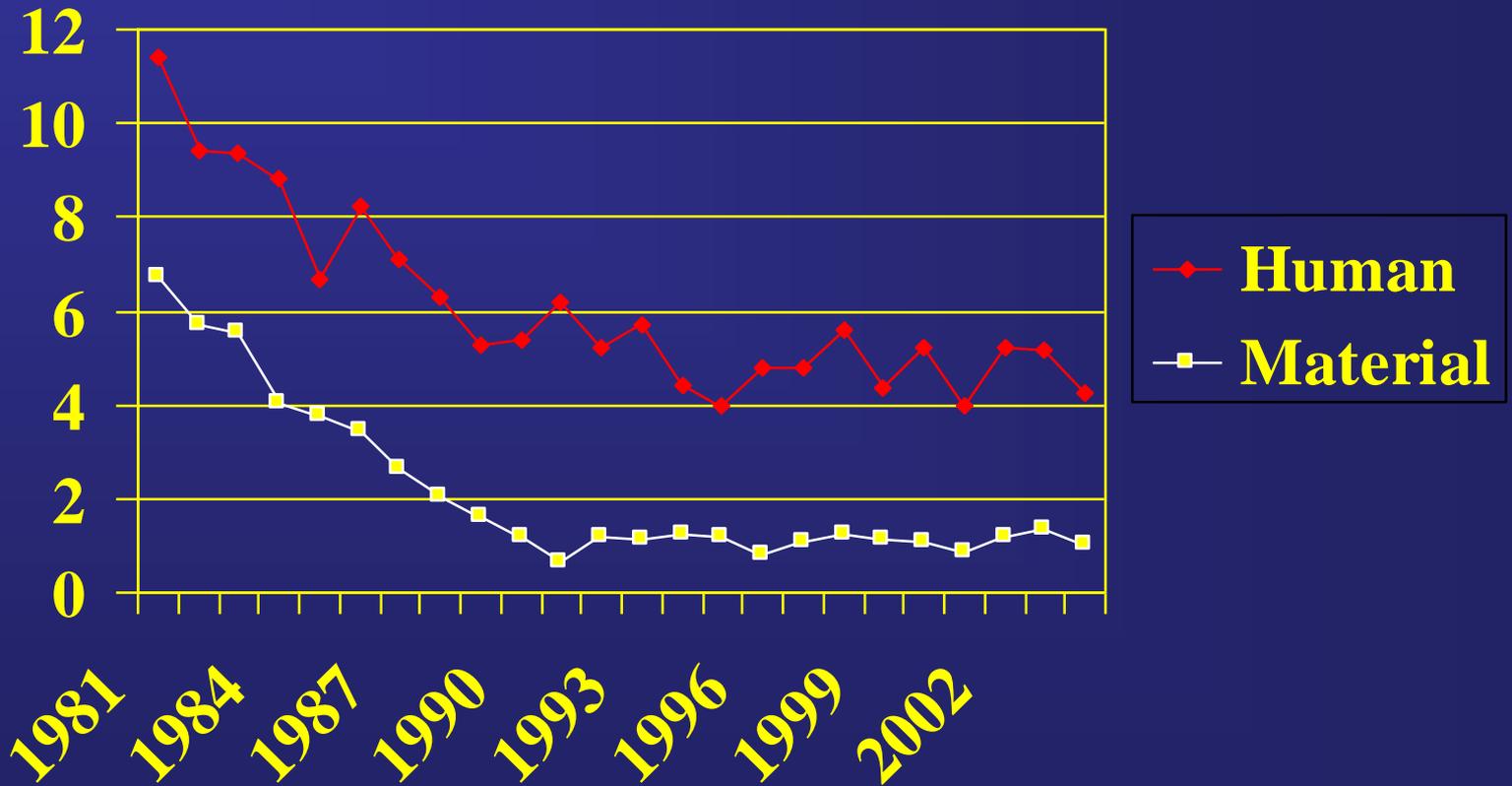
“Human beings by their very nature make mistakes; therefore, it is unreasonable to expect error-free human performance.”

Shappell & Wiegmann, 1997

- **It is not surprising then, that human error has been implicated in 60-80% of accidents in aviation and other complex systems.**
- **Accidents solely attributable to environmental and mechanical factors have been greatly reduced, but those attributable to human error continue to plague organizations.**

All Navy-Marine Corps Flight Mishaps FY81-04

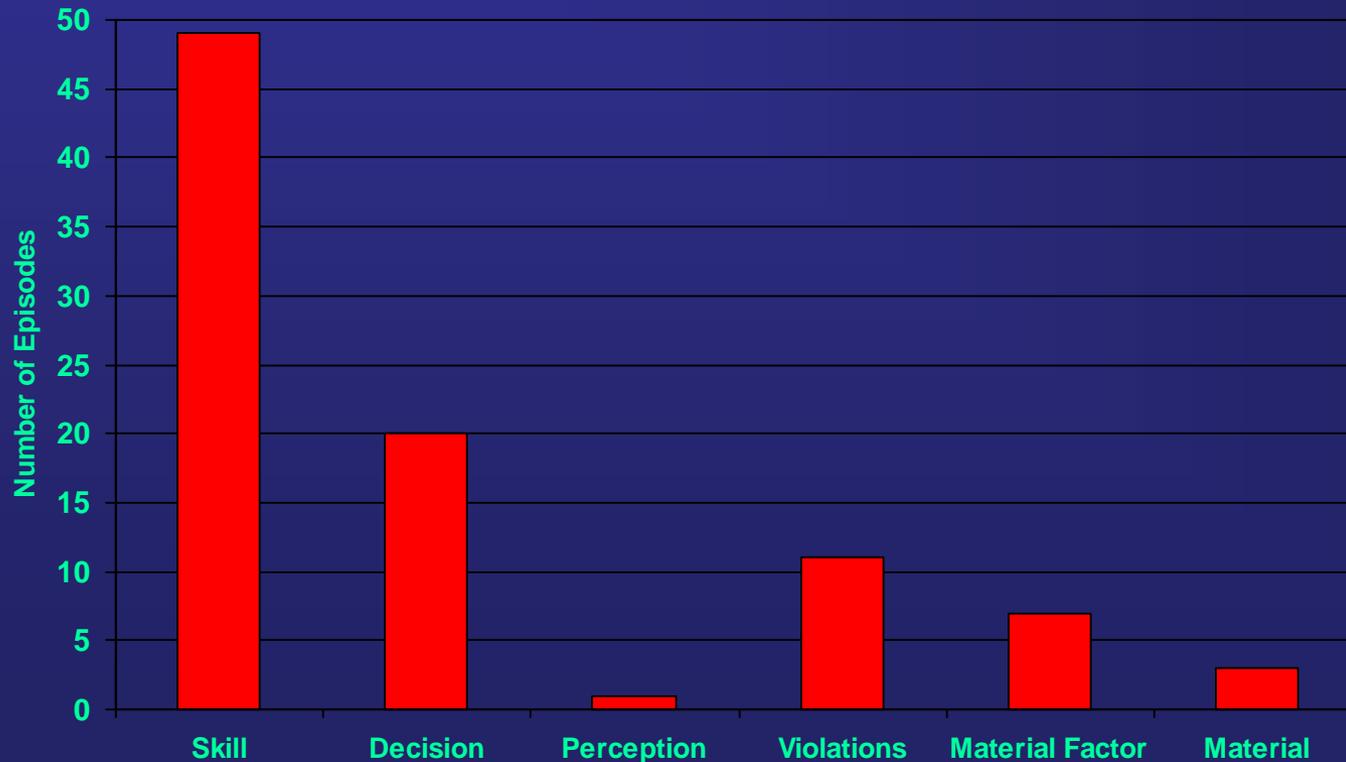
Class A, B & C FM/100K Hrs



Where to start?

To reduce mishap rate, efforts must be focused on identifying the primary causes, which in most cases is the human.

Navy F/A-18 Class A Flight Mishaps

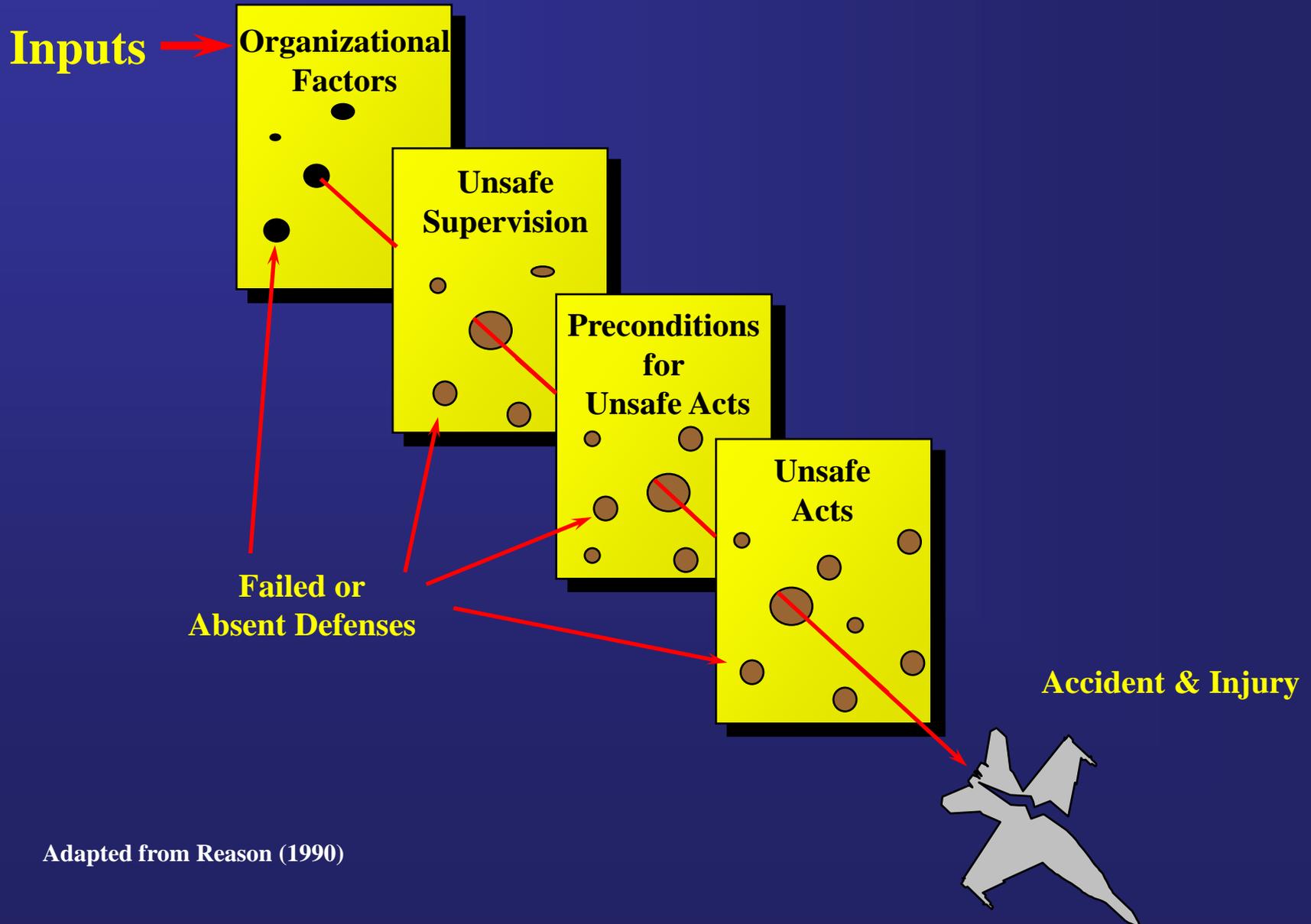


FY 00-08

Origins of (DOD) HFACS

- Starts with Reason's "Swiss Cheese" model
- Based on Human Factors Analysis and Classification System (HFACS) by Doug Weigmann & Scott Shappell
- Categorization of system failure in complex systems
 - Latent Failures
 - Active Failures
- Brings together Human Factors, Operations, Human systems, Systems Safety and Engineering Issues
 - Man, Machine, Medium, Mission, Management
- Philosophy of mishap analysis that focuses on the system instead of the individual

Reason's "Swiss-cheese" Model of Human Error



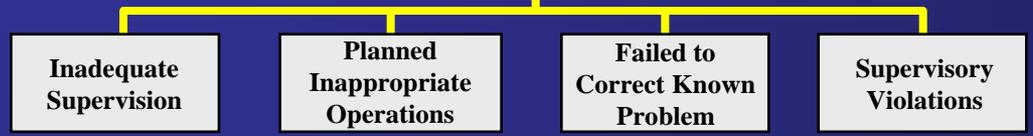
Adapted from Reason (1990)



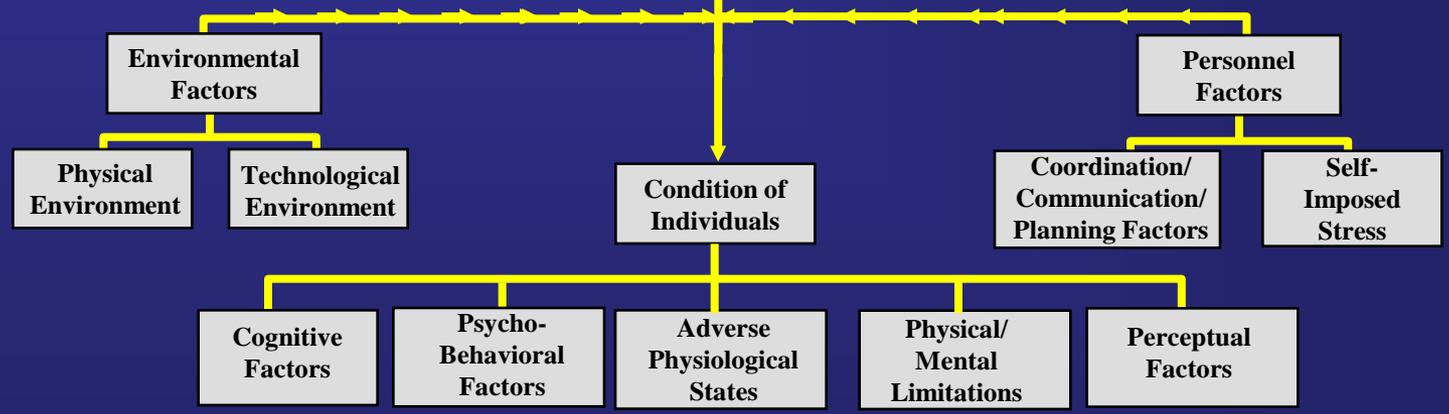
ORGANIZATIONAL INFLUENCES



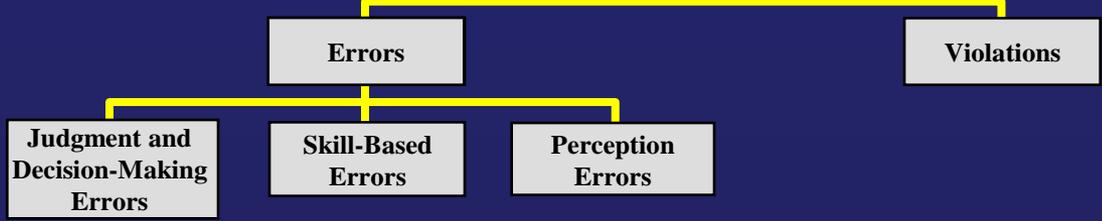
SUPERVISION



PRECONDITIONS



ACTS



DOD HFACS

- Tool used to identify specific human causes of mishaps.
- Identifies contributing conditions that allowed mishap to occur.
- Identifies contributing factors at supervisory levels.
- Attempts to identify all root causes.

Decision tree-style analysis

- Analysis starts with end result
- Traces back through the “decisions” and conditions
- Layers of Swiss Cheese are conditions at each level
- Some cheese has more holes than others...
 - Poor command climate, no rules enforcement
 - Personnel fatigued or poorly trained
 - Some environments more challenging, no ORM
- Goal – More solid cheese or countermeasures to avoid the holes

HFACS Example

- H-60 enters out of control flight after loss of tail rotor authority. Aircraft becomes uncontrollable resulting in a hard landing and rollover. Engineering investigation reveals improperly installed tail-rotor mechanism pin.

Sample HFACS Coding

Act: Procedure performed incorrectly: Tail rotor cotter pin incorrectly installed.

Preconditions: Confusion. Pin can be inserted backwards.

Supervisory: Inadequate oversight. QA missed improper pin placement.
Inadequate training. Squadron-level training was non-existent for a known problem.

Organizational: Informational resources. Lack of O-level diagram showing pin placement in relation to all other holes.

Flawed Doctrine. Other military branch had solved the problem several years before. Info not made part of Navy maintenance procedures

Data Sources

➤ SIR

- AMB
- Higher-level endorsers in CoC

➤ Aeromedical Analysis

- Squadron flight surgeon
- Independent investigation

➤ Safety Center Endorsement

- Present and past aviators
- Investigators
- Aeromedical
- Other relevant experts (ATC, maintenance)

Finalization

- Data analyzed for Class A (FY 00-08).
- HFACS coding matched with physiological data from those involved in mishap
 - Overall flight hours, hours in model, hours in last 30 days.
 - Time of day, day of week, month
 - Phase of flight
 - Physiological events
- Shows where majority of risks are found

Mishap coding

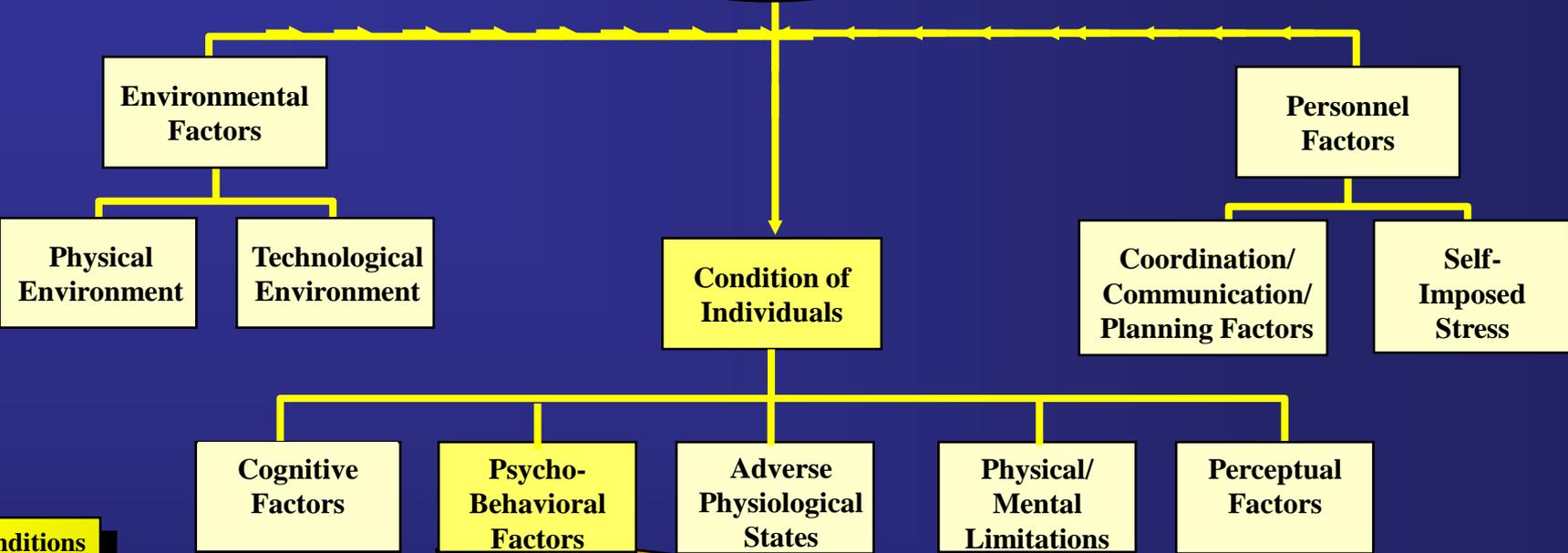
- USN/USMC - applied to aviation, PMV mishaps. Development planned for other communities (maintenance, surface, subsurface).
- USA – applied to all air and ground.
- USAF – applied to air and off-duty PMV mishaps.
- USCG – applied to air mishaps, exploring the system for surface mishaps.

Questions?



Backup slides

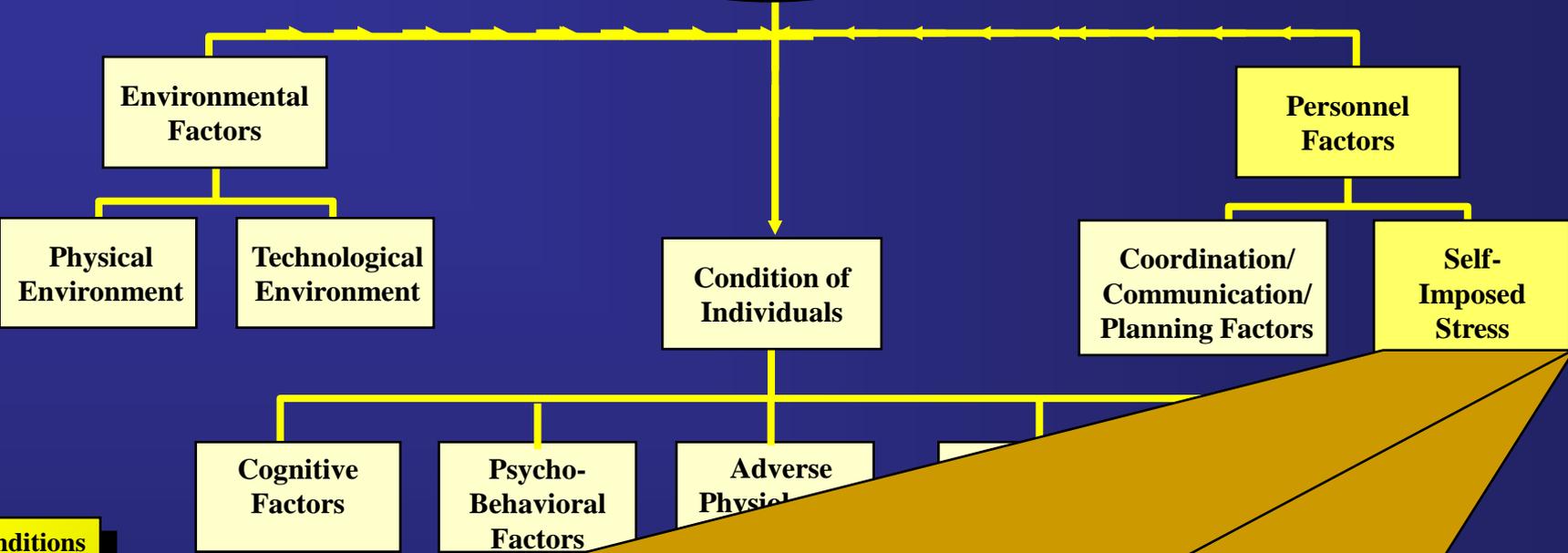
PRECONDITIONS



PSYCHO-BEHAVIORAL

- Personality Style
- Pre-Existing Personality Disorder
- Pre-Existing Psychological Disorder
- Emotional State
- Overconfidence
- Complacency
- Get-Home-Itis/Get-There-Itis
- Overaggressive

PRECONDITIONS



SELF-IMPOSED STRESS

- Alcohol
- Physical Fitness
- Drugs/Supplements/Self Medication
- Nutrition
- Inadequate Rest
- Unreported Disqualifying Medical Condition

Preconditions for Unsafe Acts

Unsafe Acts

