Human Factors Analysis and Classification System (HFACS)

Approximately 85% of Army mishap fatalities are caused by human error

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Apply HFACS to Classify Unsafe Acts

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DoD HFACS Background

2003
SECDEF challenge to reduce mishaps DoD wide

2004
JSSC HFACS Working Group established

2005
JSSC MOA

2011
DoDI 6055.07 mandates:

- Minimum data shall include human error data using a common human error categorization system that involves a human factors." taxonomy accepted among the DoD Components.
- Collect, maintain, analyze, and report human error, human factors, and human performance data identified in safety investigations.
- Safety investigation reports shall include: Recommendations for materiel risk mitigation measures, especially those that minimize potential human errors.

NOTE: *DoD HFACS Codes are currently incorporated into the mishap reporting systems of the Department of the Navy, Air Force, Coast, and the Army (ASMIS 2.0)*

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Benefits of HFACS

- For Safety Officers and SIB Investigators:
  - Facilitates the analysis of Human Factors (over 85% of all mishaps)
  - Provides framework to more structured analysis of factors influencing human error
  - Assists in the development of interview questions
  - Helps develop impactful recommendations
- For unit leaders:
  - More in-depth hazard analysis during the risk management process for mission planning
- For DoD:
  - Standardizes data that supports trend analysis and research across the DoD

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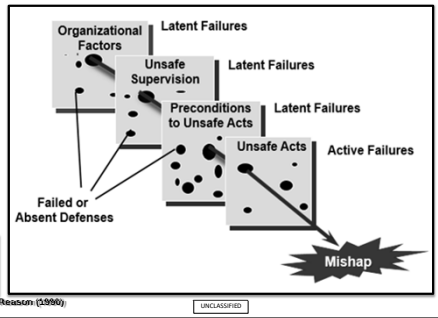
DoD HFACS Basis: Accident Causation Model



Source:
Adapted from James Reason (1990)

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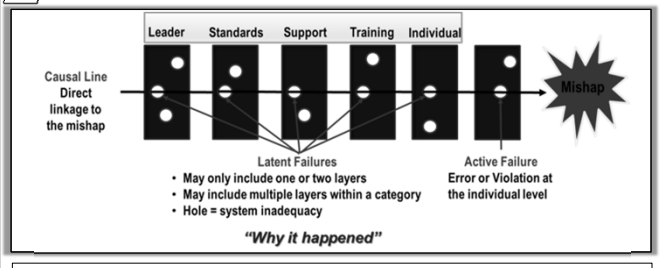
Layers of Defense



Latent failures equate to the things that we are not doing correctly and may not manifest themselves immediately. These latent failures circumvent the system of checks and balances and set the conditions for a mishap. At that point, all you need is an error or violation at the individual level to have a mishap. The holes on the causal line are those that had a direct link to the mishap.

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Classifying Unsafe Acts

Acts (Active Failures)

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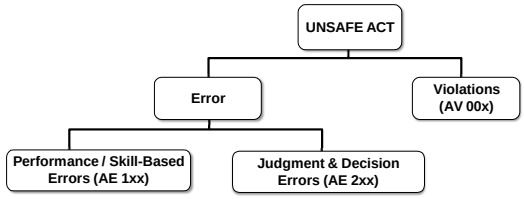
Step 1 – Unsafe Acts Code



If the operator's unsafe act is an "error," select one or more AE codes **if** each truly supports the type of "error"

If the operator's unsafe act is a "violation," select an AV code that applies to the violation act

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Active Failures/Unsafe Acts

- "What Happened?"
- Only one Unsafe Act is chosen per finding
- 13 Unsafe Act codes

Unsafe Acts

Did the mishap person(s) make a performance-based error?
(When a specific action is performed in a manner that leads to a accident.)
Yes: See Acts AE100, and go to Q2
No: go to Q2

Performance Based Errors (AE100)	
Unintended Operation of Equipment: is a factor when an individual's movements inadvertently activate or deactivate equipment, controls or switches when there is no intent to operate the control or device. This action may be initiated or unnoticed by the individual.	AE101
Checklist Not Followed Correctly: is a factor when the individual, either through an act of commission or omission, makes a checklist error or fails to run an appropriate checklist.	AE102
Procedure Not Followed Correctly: is a factor when a procedure is performed incorrectly or accomplished in the wrong sequence.	AE103
Over controlled/Under controlled Aircraft/Vehicle: is a factor when an individual responds inappropriately to conditions by either over- or under controlling the aircraft/vehicle system. The error may be a result of preconditioned or a temporary failure of coordination.	AE104
Breakdown in Visual Scan: is a factor when the individual fails to effectively execute visual scan patterns.	AE105
Rushed or Delayed a Necessary Action: is a factor when an individual takes the necessary action as dictated by the situation but performs these actions too quickly or too slowly.	AE107

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Unsafe Act Codes

Performance Based Errors

- Unintended Operations of Equipment
- Checklist Not Followed Correctly
- Procedure Not Followed Correctly
- Over controlled/Under controlled Aircraft/Vehicle
- Breakdown in Visual Scan
- Rushed or Delayed a Necessary Action

Judgment and Decision-Making Errors

- Inadequate Real-Time/Time Critical Risk Assessment
- Failure to Prioritize Tasks Adequately
- Ignored a Caution/Warning
- Wrong Choice of Action During an Operation

Violations

- Performs Work-Around Violation
- Commits Widespread/Routine Violation
- Extreme Violation – Lack of Discipline

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Apply HFACS to Classify Latent Failures

System Inadequacies (Latent Failures)

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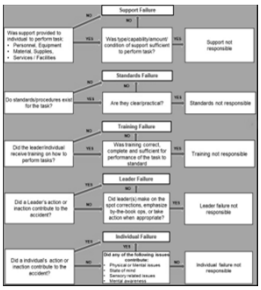
Latent Failures Codes

1. There are 96 Latent Failure codes
2. Choose as many latent failures as needed to explain "why" it happened
3. Start at the bottom, read the question on the left and answer yes or no. If yes, answer the next question to the right
4. If the category applies to the anomaly, select the failure category
5. Move to the next category on the flow chart and repeat the process



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Step 2 – Classify Individual Failures

Why did the mishap person commit the unsafe act?

INDIVIDUAL FAILURES

Medical or Physical Conditions	State of Mind Factors	Sensory Perception Factors	Mental Awareness Factors	Physical Environment
Physiologic events that decrease human performance and result in an unsafe situation	*An individual's personality traits, psychosocial problems, psychological disorders or inappropriate motivation that create an unsafe situation.*	*Degraded sensory inputs (visual, auditory or vestibular) that create a misperception of an object, threat or situation.*	*Cognitive Factors and attention management conditions that may affect the perception or performance of individuals.*	*Physical factors to which the individual is exposed such as weather, climate, fog, brownout (dust or sandstorm) or white out (snowstorm) that affect the actions of individuals.*

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M4 Range Mishap Key Information

- Soldiers transitioned from reflexive fire to expending remaining ammo.
- Soldier fired 528 5.56 mm rounds in 7 to 8 minutes – number of rounds fired rapidly and continuously should not exceed 180 rounds for the M4A1.
- Soldier did not clear the mishap weapon. He also did not place the weapon up and down range; instead, he oriented the weapon toward other Soldiers.
- The overheated M4A1 cooked off four additional times.
- No direct supervision on firing line (no lane safeties).
- Company leadership assigned the Range Safety Officer (RSO) without formal range safety training.
- Unsafe culture on the range.
- Leaders did not enforce muzzle discipline.

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M4 Mishap Finding 1

Finding 1, Contributing to the Mishap

Upon completion of firing 526 rounds of M855A1, 5.56mm ammunition through a M4A1 Carbine in 7-8 minutes on Range 301 at Fort Bradley, NY, an NCO failed to prioritize the tasks **(AE202)** of making the weapon safe upon receiving the command of cease fire. That is, the NCO failed to clear the weapon, extended the bipod, and placed the M4A1 on the ground oriented towards other Soldiers on the firing line. Actions were in contravention to Safe Weapons Handling found in Chapter 1 of TC 3-22.9C2, Rifle and Carbine. As a result, the heat generated by continuous automatic fire cooked off a round in the loaded M4A1 that was oriented across the firing line and struck a Soldier in the abdomen resulting in a fatal injury.

The Board attributed the NCO's actions to complacency **(PC208),** an untreated psychiatric disorder **(PC202),** failure to enforce existing standards **(SV001)** and an unsafe culture on the range **(OC001).** The focus on the range shifted from training to expending ammunition as communicated to the Soldiers by the OIC. Guidance provided by the OIC was to fire for 10 minutes and to let the weapons cool for 10 minutes. The Board concluded the NCO ignored the hazards associated with placing a loaded weapon on the ground oriented toward three other Soldiers and was not attentive to the risks associated with this course of action. Three years before the mishap, a psychologist verified a previous diagnosis for Attention Deficit Hyperactivity Disorder (ADHD) and instructed the NCO to return to the primary care provider for medication. There was no record of the NCO following up on the instructions from the psychologist and the Board concluded that actions on the range were consistent with ADHD.

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M4 Mishap Finding 2

Finding 2, Contributing

During the supervision of a live fire exercise on Range 31S at Fort Bradley, NY, the Officer in Charge (OIC) and the Range Safety Officer (RSO) failed to evaluate the risks associated with their decisions in the conduct of the training **(AE201)**. That is, they failed to assign line safeties, did not monitor rates of fire, and deviated from the approved course of fire. Their actions were in contravention to guidance provided in DA PAM 385-63. As a result, an unsupervised firer shot 526 rounds from a M4A1 on full automatic in less than 10 minutes (exceeding the TM warning not to fire more than 180 rounds when firing rapidly and continuously) and upon the command of cease-fire, set the M4A1 on the bipod oriented in the direction of other fires without clearing the M4A1. The M4A1 began to cook off chambered ammunition and a bullet struck a Soldier in the abdomen resulting in a fatal injury.

The Board concluded the OIC and RSO failed to enforce range safety standards **(SV001)** from local REG 385-5, which required one line safety per four firers. The RSO and OIC did not use line safeties stating that everyone was a safety and to use "big boy" rules. This created a situation where no one realized the M4A1 was not cleared and oriented toward the other Soldiers on the firing line. The Board also concluded the OIC authorized an unnecessary hazard **(SP007)** when he directed the Soldiers to fire for 10 minutes without consideration of the maximum sustained rates of fire for the M4A1 outlined in the technical manual resulting in a M4A1 cooking off four rounds. The OIC and RSO failed to provide direct supervision **(SI001)** of the firing line. The Board concluded that both individuals overvalued **(PC206)** the personal capability of the Soldiers on the range to execute the mission of expending ammunition safely.

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Step 2 – Classify Individual Failures

Why did the mishap person commit the unsafe act?

INDIVIDUAL FAILURES

Medical or Physical Conditions	State of Mind Factors	Sensory Perception Factors	Mental Awareness Factors	Physical Environment
Physiologic events that decrease human performance and result in an unsafe situation	*An individual's personality traits, psychosocial problems, psychological disorders or inappropriate motivation that create an unsafe situation.*	*Degraded sensory inputs (visual, auditory or vestibular) that create a misperception of an object, threat or situation.*	*Cognitive Factors and attention management conditions that may affect the perception or performance of individuals.*	*Physical factors to which the individual is exposed such as weather, climate, fog, brownout (dust or sandstorm) or white out (snowstorm) that affect the actions of individuals.*

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Step 3 – Classify Unsafe Supervision/Leader Failures

UNSAFE SUPERVISION / LEADER FAILURES

Inadequate Supervision? | Leader Violations? | Planning / RM Failures? | Safety Climate / Culture? | Teamwork Failure?

Unsafe Supervision

The methods, decisions or policies of the supervisory chain of command directly affect practices, conditions, or actions of individual(s) and result in human error or an unsafe situation

Leader Failure

Leaders fail to monitor mission execution and planning, correct inappropriate behavior, take appropriate action, or emphasize correct procedures resulting in an unsafe act

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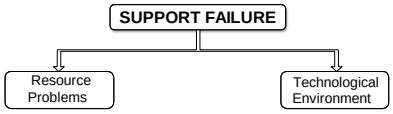
Step 4 – Classify Support Failures



Support Failure: Insufficient type, amount, capabilities, condition of support to perform the mission correctly

Support includes personnel, equipment, materiel, supplies, services, or facilities

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Step 4 – Support Failures

Resource Problems (OR) are factors in a mishap if resource management, processes, or policies, directly or indirectly, influence system safety and results in inadequate management or creates an unsafe situation. This category refers to the management, allocation, and maintenance of organizational resources, monetary, and equipment / facilities. "Funding" issues refer to the management of nonhuman resources, primarily monetary resources. For example, excessive cost cutting and lack of funding for proper equipment have adverse effects on operator performance and safety. Finally, "equipment" refers to issues related to equipment design, including the purchasing of unsuitable equipment, inadequate design of workspaces, and failures to correct known design flaws. Management should ensure that human-factors engineering principles are known and utilized and that existing specifications for equipment and workspace design are identified and met.

Personnel Selection & Staffing (OS) are factors if personnel management processes or policies, directly or indirectly, influence system safety and results in inadequate error management or creates an unsafe situation. Issues that directly influence safety include selection (e.g., background checks), training, and staffing / manning.

S1. Did a problem with resources create an unsafe situation?

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Step 4 – Support Failures *(continued)*

Technological Environment is a factor in a mishap when cockpit, vehicle, control station or workspace design factors or automation affect the actions of individuals and result in human error or an unsafe situation.

S2. Did the technological environment (materiel) affect the mishap person(s)?

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Step 5 – Classify Training Failures

TRAINING FAILURE

- Training is incorrect, incomplete, insufficient for performance to standard

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Step 6 – Classify Standards Failures

STANDARDS FAILURE

Did an organizational written standards or written policy at any level create an unsafe situation?

- **Standards Failure:** Standards do not exist, or these are unclear, impractical, or inadequate
- ***Organizational Policy and Processes Issues (OP):*** *Organizational processes negatively influence performance and result in an unsafe situation or human error. This includes RM practices, procedures, and oversights which negatively influence individual, supervisory, and/or team performance and results in unrecognized hazards and/or uncontrolled risk*
- ***"Procedures"*** *are the official or formal procedures as to how the task or job is to be done. All of these, if inadequate, can negatively impact employee supervision, performance, and safety*

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References

- DoDI 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping*
- AR 385-10, *The Army Safety and Occupational Health Program*
- DA Pam 385-40, *Army Accident Investigations and Reporting*
- *DoD Human Factors Analysis and Classification System (HFACS)*
- *USACRC Human Factors Analysis and Classification System (HFACS) Guidebook*

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Questions or Comments?

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Evil Eight (1 – 4)

#1 - #4: On-Duty Class A Army Vehicle Mishaps

71% of military vehicle occupant fatalities were not using seat belts/restraint systems. Of those, all but one of the occupants using a seat belt/restraint survived. In FY19, of the five vehicle mishaps that involved occupant fatalities, six of six fatalities were not wearing seat belts/restraints.*

The Fix:
- Enforce use of seat belts/restraints
- Emphasize use of seat belts/restraints in mission briefings
- Conduct thorough pre-combat checks

Poor mission planning (rehearsal not conducted for that event, inadequate pre-mission briefings and orders, troop leading procedures not done, executed poorly, etc.) contributed to 79% of the mishaps.**

The Fix:
- Conduct rehearsals, thorough briefings, pre-combat checks/inspections
- Incorporate mission planning and risk mitigation into every aspect of unit operations
- Reassess risk if the mission changes
- Leader presence

Unit driver training programs were substandard (no program existed, programs were pencil whipped or fabricated, drivers were not trained on the specific vehicle variant or for conditions, etc.) in 67% of the units investigated.**

The Fix:
- Use your master drivers
- Review and validate your driver training programs
- Select the right Soldiers for training
- Train and license your Soldiers on all pieces of equipment they are required to operate

A leader failed to correct a deficiency or standards violation in 75% of mishaps.**

The Fix:
- Leader knowledge
- Leader presence
- Leader gumption

- Leader Knowledge
- Leader Presence
- Leader Gumption

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* Based on available data for all on-duty Class A mishaps within a five-year period.
** Based on on-duty vehicle mishaps investigated by the USACRC within a five-year period.

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Evil Eight (5 – 8)

#5 - #7: Off-Duty Class A PMV Mishaps Involving Indiscipline

More than 55% of indiscipline-related mishaps occurred between 1700 Friday and 0500 Monday.***

The Fix:
- Conduct face-to-face counseling with subordinates
- Ask questions like, "What are your plans this weekend?"
- Encourage use of the buddy system
- Use ARAP to its full potential

Driver mistakes (excessive speed, fatigue, etc.) contributed to 47% of the Class A mishaps.***

The Fix:
- Identify Soldiers who display poor driving skills
- Coach and mentor your Soldiers – teach them how to manage off-duty risk
- Make discussions about safety and loss prevention personal

Driver misconduct (drinking and driving, failure to wear seat belts, etc.) contributed to 42% of the Class A mishaps.***

The Fix:
- Identify Soldiers who exhibit high-risk behavior
- Make discussions about safety and loss prevention personal
- Use Preliminary Loss Reports and other examples to drive home the hazards associated with off-duty driving

Are your leaders taking counseling seriously? Do your leaders know how to counsel?

8: Class A Small Arms Mishaps

Since FY10, there have been 60 on- and off-duty Class A mishaps (78% unintended discharges, 58% of off-duty weapons fatalities involved alcohol) across the Army involving small arms.

The Fix:
- Always clear the weapon AND enforce muzzle awareness
- Do not mix weapons and alcohol
- There is no 'admin' time during live-fire training

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*** Based on analysis of indiscipline-related PMV mishaps within a five-year period.

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