

DEPARTMENT OF THE ARMY
United States Army Combat Readiness Center
Fifth Avenue, Building 4905
Fort Rucker, Alabama 36362-5463

DEPARTMENT OF THE NAVY
Naval Safety Center
375 A Street
Norfolk, Virginia 23511-4399

Headquarters, United States Marine Corps (Safety Division)
2 Navy Annex
Washington, DC 20380

DEPARTMENT OF HOMELAND SECURITY
United States Coast Guard, Health and Safety Directorate
2100 Second Street SW, Room 3317
Washington, DC 20380

DEPARTMENT OF THE AIR FORCE
Air Force Chief of Safety
1400 Air Force Pentagon, Room 5E161
Washington, DC 20593

10 May 05

MEMORANDUM OF AGREEMENT
BETWEEN
ARMY COMBAT READINESS CENTER
AND
NAVAL SAFETY CENTER
AND
HEADQUARTERS, UNITED STATES MARINE CORPS (SAFETY DIVISION)
AND
UNITED STATES COAST GUARD HEALTH AND SAFETY DIRECTORATE
AND
AIR FORCE SAFETY CENTER

Subj: POLICY ON THE COLLECTION AND ANALYSIS OF MISHAP HUMAN FACTORS DATA

Encl: (1) Joint Services Safety Chiefs human factors analysis and classification system and users guide

1. **Purpose.** To insure uniform collection and analysis of human factors data resulting from military mishaps.
2. **Scope.** This policy addresses only the military service safety centers and their collection of human factors data from mishaps. It does not affect any other operation of the services.
3. **Background.** The services have been collecting human factors data using many different models resulting in a disparity in data and difficulty in creating joint approaches to mitigating the human factors hazards present in a large majority of mishaps. The Joint Services Safety Chiefs Conference (JSSC) requested that the services modify and adopt a version of the Human Factors Analysis and Classification System (HFACS).

Subj: POLICY ON THE COLLECTION AND ANALYSIS OF MISHAP HUMAN FACTORS DATA

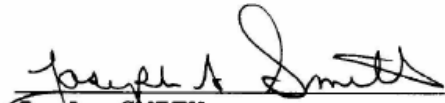
The Human Factors Working Group (HFWG) of the Aviation Safety Improvements Task Force and JSSC was charged to develop and field joint human factors analysis taxonomy. The Army will lead the development of a training program for use by

all the services. Each service will develop their service specific implementation plan with the goal of implementation two years after signature of this MOA.

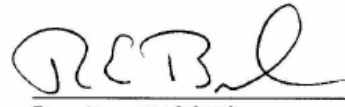
4. **Policy.** Enclosure (1) is the jointly created HFACS taxonomy. The parties agree to collect and analyze mishap human factors using this taxonomy.

5. **Review and distribution of policy.** HFWG shall meet, discuss, and approve additions and changes to enclosure (1) on a semiannual basis during JSSC meetings. A copy of enclosure (1), with all approved changes, shall be published prominently on the Naval Safety Center website. That posting may be used as a target link from all parties' web sites.


6. **Effective date, review, modification, termination, and copies of this agreement.** This agreement is effective on the date of the last signature and shall remain in effect until rescinded, revised, or superseded. This agreement may be cancelled at any time by mutual agreement, by any party with at least thirty (30) days written notice, or by implementation of a permanent Department of Defense directive or instruction regarding HFACS. All parties shall review this agreement each year. This agreement may be modified, in writing, with the written agreement of all parties. A written request for modification shall be provided to all parties at least sixty (60) days prior to the proposed date of change. This agreement is executed in five separate originals, each to be held by one party (Army Combat Readiness Center (SJA), Naval Safety Center (03), Headquarters, U.S. Marine Corps, Coast Guard Health and Safety Directorate, and Air Force Safety Center (JA)).




J. A. SMITH
BG USA
Director of Army Safety



R. E. BROOKS
RADM USN
Commander, Naval Safety Center



F. WENGER III
COL USMC
Director of Safety



P. J. HIGGINS
RADM USPHS
Director of Health and Safety
U.S. Coast Guard



M. J. MCFANN
MG USAF
Chief of Safety

Department of Defense Human Factors (DoD HFACS 7.0) Analysis and Classification System

(v. 7.0)

Executive Summary

This Department of Defense Human Factors (DoD HF) Guide explains procedures for investigating and reporting all DoD mishaps. It supports DoDI 6055.07, *Mishap Investigation, Reporting, and Record Keeping*. The DoDI directs DoD components to “Establish procedures to provide for the cross-feed of human error data using a common human error categorization system that involves human factors taxonomy accepted among the DoD Components and U.S. Coast Guard.” It is intended for use by all persons who investigate, report and analyze DoD mishaps, and is particularly tailored to the needs of persons assigned to Interim Safety Boards and formal Safety Investigation Boards following all Classes of mishaps. There are myriad potential human factors, all of which need to be assessed for relevancy during a mishap investigation. *No investigator, flight surgeon, physiologist, human factors consultant or aviation psychologist can be expected to be fully familiar with all potential human factors*

When using this human factors model, the investigator should consider applying the model to three distinct areas of consideration: environmental, individual and the event or mishap. The mishap crew, operator, or team reacts to the environment to which they are exposed. The environmental factors cover not only the physical environment to which the individual members are exposed, but also the organizational and supervisory environments and specific physical and technological preconditions. The individual factors cover acts, precondition and supervision factors. The mishap factors can cross all four tiers of the model. The investigator can apply this model by entering at any tier that is specifically related to environmental, individual or mishap factors discovered during the analysis. This model can be used as either a primary or secondary tool to investigate both active and latent failures. Our model is designed to present a systematic, multidimensional approach to error analysis. This human factors model covers human error from three perspectives:

- Cognitive Viewpoint and Human System Interaction and Integration
- Human-to-Human Interaction
- Sociocultural and Organization

When using our DoD HF Taxonomy for either primary investigation or secondary analysis, we must assume error can mean several things:

Error can mean several things:

- *Error as the Failure itself (e.g. the operator's decision was an error.)*
- *Error as the cause of failure (e.g. The mishap was due to failure to provide guidance – supervisory error)*
- *Error as a process or, more specifically, as a departure from a standard (intentional or unintentional as a one time or routine occurrence)*

A reasonable synthesis of these assumptions, as suggested by Senders and Moray (1991), is the following: Human error occurs when human action is performed that was either (1) not intended by the actor, (2) not desired according to some specified set of rules or by some external observer, or (3) contributed to the task or system “going outside its acceptable limits.”

This DoD Guide starts with a brief history of the development of the DoD HFACS followed by an introduction and description of the human factor and human performance application of this model. The Guide concludes with a high-level structural overview of the taxonomy and definitions.

History

The Secretary of Defense published a memorandum 19 May 2003 challenging the services to reduce mishaps by 50% over a 2 year period. The desired end state was to increase operational readiness. This memorandum resulted in the creation of the DoD Safety Oversight Committee to provide guidance to the DoD and individual services on best practices and methods to accomplish this mandate.

The Aviation Safety Improvement Task Force (ASI-TF) was established to meet these DoD requirements. The ASI-TF subsequently established the Human Factors Working Group with a charter to identify data-driven, benefit focused, human-factor and human-performance safety strategies designed to identify hazards, mitigate risk and reduce aviation mishaps inherent in aircraft operations throughout the DoD.

Enclosure (1)

Introduction

Mishap or event investigation can be extremely difficult, time-consuming and stressful, but it can also be rewarding when we recognize that the contributions we make will improve safety. A thorough mishap investigation is absolutely necessary to determine the cascading events causal to a mishap, and to recommend corrective actions to prevent recurrence. This guide provides the mishap investigator with a proven template that aids in organizing the investigation while providing a detailed analysis of human error for on-scene investigation and post-hoc mishap data analysis, revealing previously unidentified human-error trends and hazards.

Human error continues to plague both military and civilian mishaps. Analysis indicates that ***human error is*** identified as a causal factor in ***80 to 90 percent of mishaps***, and is ***present but not causal in another 50 to 60 percent*** of all mishaps, and is therefore the single greatest mishap hazard. Yet, simply writing off mishaps to "operator error" is a simplistic, if not naïve, approach to mishap causation and hazard identification. Further, it is well established that mishaps are rarely attributed to a single cause, or in most instances, even a single individual. Rather, mishaps are the end result of myriad latent failures or conditions that precede active failures (Shappell in "*The Naval Flight Surgeon's Pocket Reference to Aircraft Mishap Investigation*"). The goal of a mishap or event investigation is to identify these failures and conditions in order to understand why the mishap occurred and how it might be prevented from happening again.

This reference is an adjunct to formal instructions that govern mishap investigation and is not meant to supplant the other references that address service-specific guidance for mishap investigation. Use this guide as a ready reference in the field to ensure that your data retrieval is complete and that you preserve perishable evidence. This guide is also designed to ensure uniformity of inter-service human factors definitions and data driven analysis.

Description

This guide is designed for use as a comprehensive event/mishap, human error investigation, data identification, analysis and classification tool. It is designed for use by all members of an investigation board in order to accurately capture and recreate the complex layers of human error in context with the individual, environment, team and mishap or event.

In the past, investigators have thrown human factors analysis to the medical investigator and have asked him or her to do this work on their own. This practice has sometimes produced human error analyses that differed considerably from the boards' investigation and findings of fact. Integrating human factors analysis into all aspects of the investigation will result in a much more coherent final product.

As described by Reason (1990), *active failures* are the actions or inactions of operators that are believed to cause the mishap. Traditionally referred to as "error", they are the last "acts" committed by individuals, often with immediate and tragic consequences. For example, an aviator forgetting to lower the landing gear before touchdown or showing off through a box canyon will yield relatively immediate, and potentially grave, consequences.

In contrast, *latent failures* or *conditions* are errors that exist within the organization or elsewhere in the supervisory chain of command that effect the tragic sequence of events characteristic of a mishap. For example, it is not difficult to understand how tasking crews or teams at the expense of quality crew rest can lead to fatigue and ultimately errors (active failures) in the cockpit. Viewed from this perspective then, the actions of individuals are the end result of a chain of factors originating in other parts (often the upper echelons) of the organization. The problem is that these latent failures or conditions may lie dormant or undetected for some period of time prior to their manifestation as a mishap.

The question for mishap investigators and analysts alike is how to identify and mitigate these active and latent failures or conditions. One approach is the "Domino Theory" which promotes the idea that, like dominoes stacked in sequence, mishaps are the end result of a series of errors made throughout the chain of command.

A "modernized" version of the domino theory is Reason's "Swiss Cheese" model that describes the levels at which active failures and latent failures/conditions may occur within complex operations (see figure 1). Working backward from the mishap, the first level of Reason's model depicts those *Unsafe Acts of Operators* (operator, maintainers, facility personnel, etc.) that lead to a mishap. Traditionally, this is where most mishap investigations have focused their examination of human error, and consequently where most causal factors are uncovered. After all, it is typically the actions or inactions of individuals that can be directly linked to the mishap. Still, to stop the investigation here only uncovers part of the story.

What makes Reason's model particularly useful in mishap investigation is that it forces investigators to address latent failures and conditions within the causal sequence of events.

For instance, latent failures or conditions such as fatigue, complacency, illness, and the physical/technological environment all affect performance but can be overlooked by investigators with even the best of intentions.

These particular latent failures and conditions are described within the context of Reason's model as *Preconditions for Unsafe Acts*. Likewise, *Supervision* can promote unsafe conditions of operators and ultimately unsafe acts will occur. For example, if an Operations Officer were to pair a below average team leader with a very junior/inexperienced crew, the result is increased risk of mission failure. Regardless, whenever a mishap does occur, the crew naturally bears a part of the responsibility and accountability. However, latent failures or conditions at the supervisory level are often equally responsible for poor hazard analysis and subsequent increased mission risk, and may ultimately cause the mishap. In this particular example, the crew was set up for the opportunity for failure.

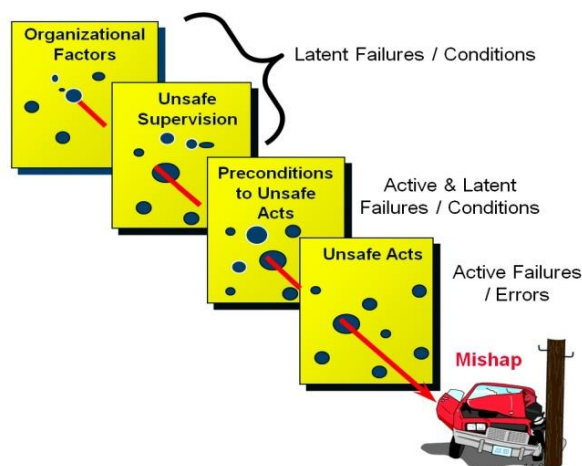


figure 1. The "Swiss Cheese" Model (adapted from Reason, 1990)

Reason's model does not stop at supervision; it also considers *Organizational Influences* that can impact performance at all levels. For instance, in times of fiscal constraints, funding may be short and may lead to limited training opportunities. Supervisors are sometimes pressed to task "non-proficient" crews with complex missions. Not surprisingly, unintended and unrecognized errors may appear, and mission performance will consequently suffer. As such, hazards and risks at all levels must be addressed if any mishap investigation process is going to be effective.

The investigation process then endeavors to detect and identify the "holes (*hazards*) in the cheese" (see figure 1). So how do we identify these hazards? *Aren't they really too numerous to define? After all, every mishap is unique, so the hazards will always be different for each mishap ... right?* Well, it turns out that each mishap is not unique from its predecessors. In fact, most mishaps have very similar causes. They are due to the same holes in the cheese, so to speak. The hazards identified in each new mishap are not unique to that mishap. Therefore, if you know what these system failures/hazards or "holes" are, you can better identify their roles in mishaps -- or better yet, detect their presence and develop a risk mitigation strategy correcting them **before** a mishap occurs.

Drawing upon Reason's (1990) and Wiegmann and Shappell's (2003) concept of active failures and latent failures/conditions, a new DoD taxonomy was developed to identify hazards and risks called the DoD Human Factors Analysis and Classification System. DoD-HFACS describes four main tiers of failures/conditions:

- 1) Acts,
- 2) Preconditions,
- 3) Supervision, and
- 4) Organizational Influences

A brief description of the major tiers with associated categories and sub-categories follows, beginning with the tier most closely tied to the mishap.

Attachment 1 is the in-depth reference document, and contains all the currently accepted definitions for the sub codes that fall within the 4 major tiers of human error. This document is subject to review and update every 6 months by the Human Factors Working Group of the Joint Services Safety Chiefs. For comments please contact the Command Flight Surgeon of the Naval Safety Center.

Version 7.0 (2014)

Note In the electronic version of this document each of the HFACS Model boxes are hyper-linked to more in-depth descriptions

DoD HFACS 7.0 Nanocodes (definitions): After any event investigators must gather human factors evidence. One method to do this is to start with the event outcome and create a time line documenting each step that leads up to the event. As you probe backwards determine whether a material (a part failed) event occurred or an individual committed or failed to commit an act the resulted in the outcome event.

At each step the investigator must document who committed the act then utilize the taxonomy to further classify the act. Once the investigator has identified the nanocode that reflects the act he/she must dig deeper.

The next step is to look evaluate the preconditions that resulted in the unsafe act. A method that may help evaluating preconditions is to review each of the categories and sub categories in this tier of HFACS and rule in or eliminate the various preconditions that lead to the act. Once the investigator has fully devolved into the preconditions and has recorded all preconditions for the act the focus must move on to supervisory and subsequent organizational issues that contributed to the precondition.

It is recommend that for each nanocode chosen the investigator write a short narrative discussing the nanocode, then conduct an evaluation of each item in the time line. This should give the investigator a thorough human factors picture of all the events that led up to the mishap.

1. Unsafe Acts: Acts are those factors that are most closely tied to the mishap, and can be described as active failures or actions committed by the operator that result in human error or unsafe situation. We have identified these active failures or actions as Errors and Violations.

Using this error analysis process, the investigator must first determine if an individual or team committed an active failure. If so, the investigator must then decide if an error or violation occurred. Once this is done, the investigator can further define the error. (See Table 1).

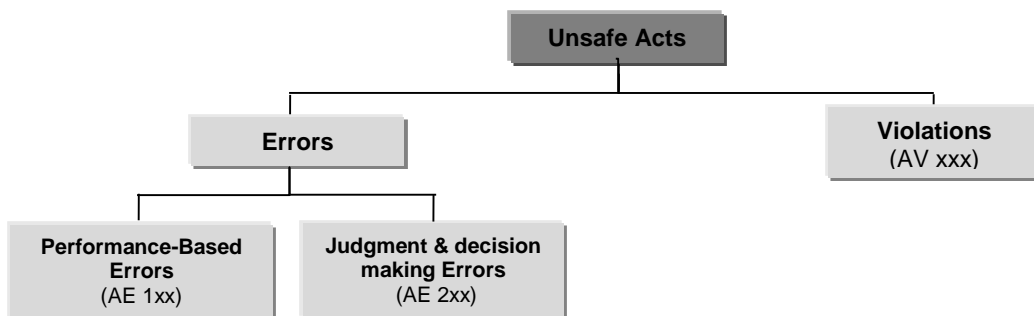


Table 1. Categories of Acts of Operators

Errors: are factors in a mishap when mental or physical activities of the operator fail to achieve their intended outcome as a result of performance-based or judgment and decision making errors, leading to an unsafe situation. Errors are unintended.

Violations: Violations are factors in a mishap when the actions of the operator represent willful disregard for rules and instructions and lead to an unsafe situation. Unlike errors, violations are deliberate. (Table 1a)

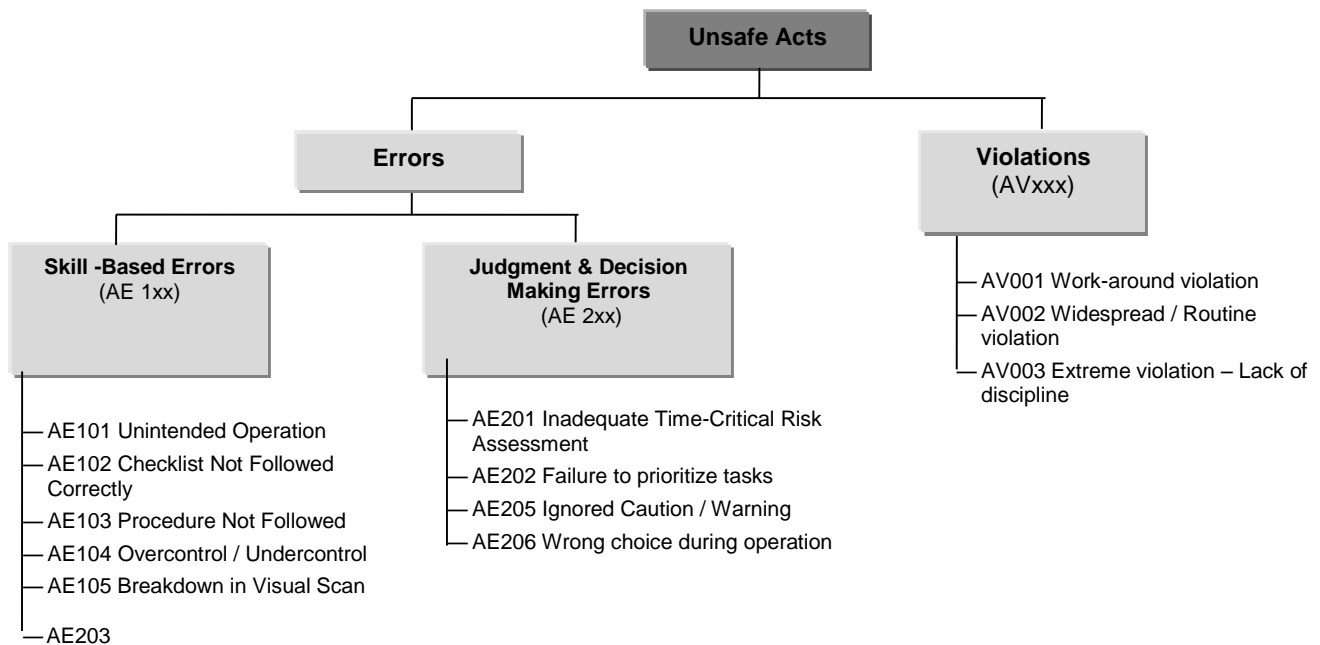


Table 1a Unsafe Acts

Performance / Skill - Based Errors: are factors that occur when a specific action is performed in a manner that leads to a mishap. (In other words, when errors occur in the operator's execution of a routine, highly practiced task relating to procedure, training or proficiency and result in an unsafe a situation.)

- **AE101 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 noticed or unnoticed by the individual.
- **AE102 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.
- **AE103 Procedure Not Followed Correctly:** is a factor when a procedure is accomplished incorrectly or in the wrong sequence or using the wrong technique.
- **AE104 Over-control / Under-control of the Vehicle or System:** is a factor when an individual responds inappropriately to conditions by either over controlling or under controlling the aircraft/vehicle or system. The error may be a result of preconditions or a temporary failure of coordination.
- **AE105 Breakdown in Visual Scan:** is a factor when the individual fails to effectively execute learned / practiced visual scan patterns.
- **AE203 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.

Judgment and Decision-Making Errors: are factors that occur when an individual proceeds as intended, yet the plan proves inadequate or inappropriate for the situation, “An honest mistake.”

- **AE201 Inadequate Real-Time / Time-Critical Risk Assessment:** is a factor when an individual fails to adequately evaluate the risks associated with a particular course of action and this faulty evaluation leads to inappropriate decision-making and subsequent unsafe situations.
- **AE202 Failure to Prioritize Tasks Adequately:** is a factor when the individual does not organize, based on accepted prioritization techniques, the tasks needed to manage the immediate situation.
- **AE205 Ignored a Caution / Warning:** is a factor when a caution or warning is perceived and understood by the individual but is ignored by the individual.
- **AE206 Wrong Choice of Action during Operation:** is a factor when the individual, through faulty logic or erroneous expectations, selects the wrong course of action.

Violations: are factors when an individual *intentionally (willful disregard)* breaks the rules and instructions. Violations are deliberate.

- **AV001 Performs Work-around Violation:** is a factor when the consequences/risk of violating published procedures was recognized, consciously assessed and honestly determined by the individual, crew or team to be the best course of action. Routine “work-arounds” and unofficial procedures that are accepted by the community as necessary for operations are also captured under this code.
- **AV002 Commits Routine / Widespread Violation:** is a factor when a procedure or policy violation is systemic in a unit/setting and not based on a risk assessment for a specific situation. It needlessly commits the individual, team, or crew to an unsafe course-of-action. These violations may have leadership sanction and may not routinely result in disciplinary/administrative action. Habitual violations of a single individual or small group of individuals within a unit can constitute a routine/widespread violation if the violation was not routinely disciplined or was condoned by supervisors.
- **AV003 Extreme Violation - Lack of Discipline:** is a factor when an individual, crew or team intentionally violates procedures or policies without cause or need. These violations are unusual or isolated to specific individuals rather than larger groups. There is no evidence of these violations being condoned by leadership. These violations may also be referred to as “exceptional violations.” (NOTE: These violations may also carry UCMJ consequences. Boards should consult the Judge Advocate of the convening authority.)

2. Preconditions: Preconditions are factors in a mishap if active and/or latent preconditions such as conditions of the operators, environmental or personnel factors affect practices, conditions or actions of individuals and result in human error or an unsafe situation (Table 2). In this error analysis model preconditions include *Environmental Factors*, *Condition of the Individuals* and *Personnel Factors*.

Note: ~67% of HFACS codes are in Preconditions

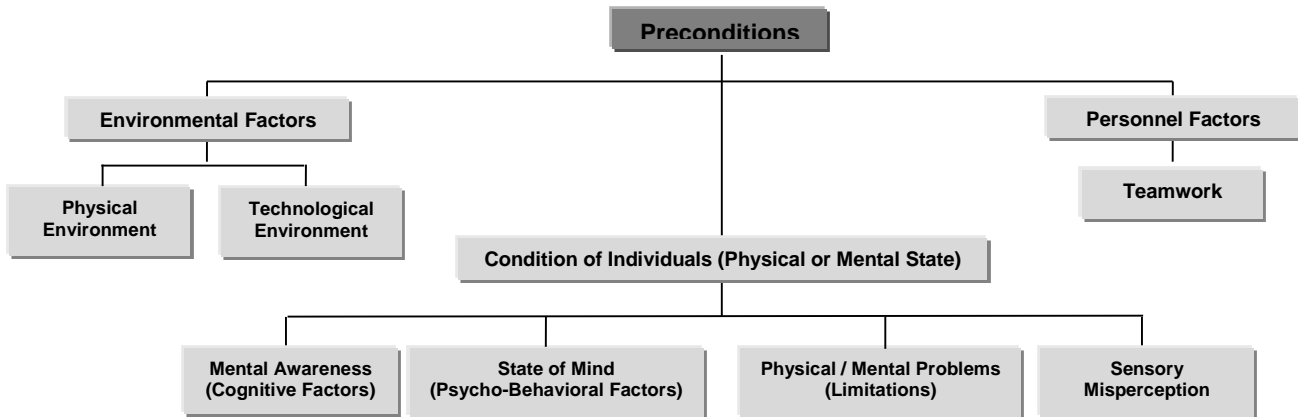


Table 2. Categories of Preconditions for Unsafe Acts

Preconditions - Environmental Factors: Are factors in a mishap if *physical* or *technological* factors affect practices, conditions, and actions of an individual and result in human error or an unsafe situation. Environmental factors include:

Physical Environment (PE100): (Table 2a)

Technological Environment (PE200): (Table 2a)

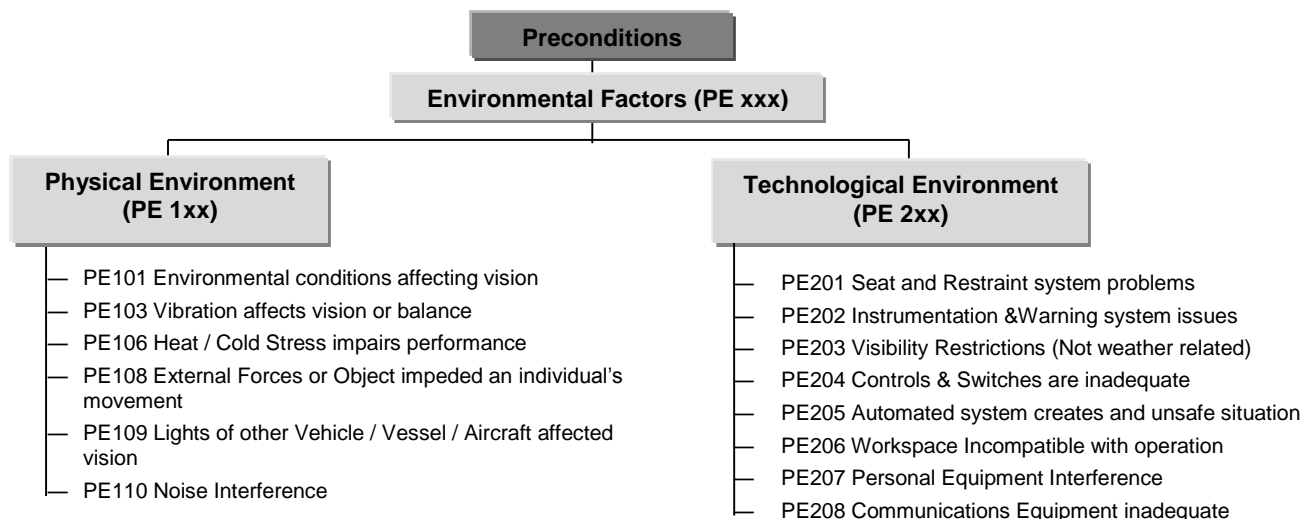


Table 2a. Environmental Factors

Preconditions - Environmental Factors

Physical Environment: Are factors in a mishap if environment such as weather, climate, fog, brownout (dust or sand storm) or white out (snow storm) that affect the actions of individuals.

- **PE101 Environmental Conditions Affecting Vision:** is a factor that includes obscured windows; weather, fog, haze, darkness; smoke, etc.; brownout/whiteout (dust, snow, water, ash or other particulates); or when exposure to windblast affects the individual's ability to perform required duties.
- **PE103 Vibration Affects Vision or Balance:** is a factor when the intensity or duration of the vibration is sufficient to cause impairment of vision or adversely affect balance.
- **PE106 Heat / Cold Stress Impairs Performance:** is a factor when the individual is exposed to conditions resulting in compromised performance.
- **PE108 External force or Object Impeded an Individual's Movement:** t is a factor when acceleration forces of longer than one second cause injury, prevent or interfere with the performance of normal duties. Do not use this code to capture G-induced loss of consciousness
- **PE109 Lights of Other Vehicle / Vessel / Aircraft Affecting Vision:** is a factor when the absence, pattern, intensity or location of the lighting of other vehicle/vessel/aircraft prevents or interferes with safe task accomplishment.
- **PE110 Noise Interference:** is a factor when any sound not directly related to information needed for task accomplishment interferes with the individual's ability to perform that task.

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

- **PE201 Seat and Restraint System Problems:** is a factor when the design of the seat or restraint system, the ejection system or seat comfort has poor impact-protection qualities.
- **PE202 Instrumentation and Warning System Issues:** is a factor when instrument factors such as design, reliability, lighting, location, symbology, size, display systems, auditory or tactile situational awareness or warning systems create an unsafe situation.
- **PE203 Visibility Restrictions (not weather related):** is a factor when the lighting system, windshield/windscreen/canopy design, or other obstructions prevent necessary visibility. This includes glare or reflections on the windshield/windscreen/canopy. Visibility restrictions due to weather or environmental conditions are captured under PE101.
- **PE204 Controls and Switches are Inadequate:** is a factor when the location, shape, size, design, reliability, lighting or other aspect of a control or switch are inadequate.
- **PE205 Automated System Creates an Unsafe Situation:** is a factor when the design, function, reliability, symbology, logic or other aspect of automated systems creates an unsafe situation.
- **PE206 Workspace Incompatible with Operation:** is a factor when the workspace is incompatible with the task requirements and safety for an individual.
- **PE207 Personal Equipment Interference:** is a factor when the individual's personal equipment interferes with normal duties or safety.
- **PE208 Communication Equipment Inadequate:** is a factor when communication equipment is inadequate or unavailable to support task demands. This includes electronically or physically blocked transmissions. Communications can be voice, data or multi-sensory.

Preconditions - Condition of Individuals / Physical or Mental State: Are factors in a mishap if cognitive, psycho-behavioral, adverse physical state, or physical/mental limitations affect practices, conditions or actions of individuals and result in human error or an unsafe situation. Condition of the Individuals include:

Mental Awareness (PCxxx): (Table 2b)

State of Mind (PC2xx) (Table 2b)

Physical Problems (PCxxx) (Table 2c)

Sensory Misperception (PC5xx) (Table 2c)

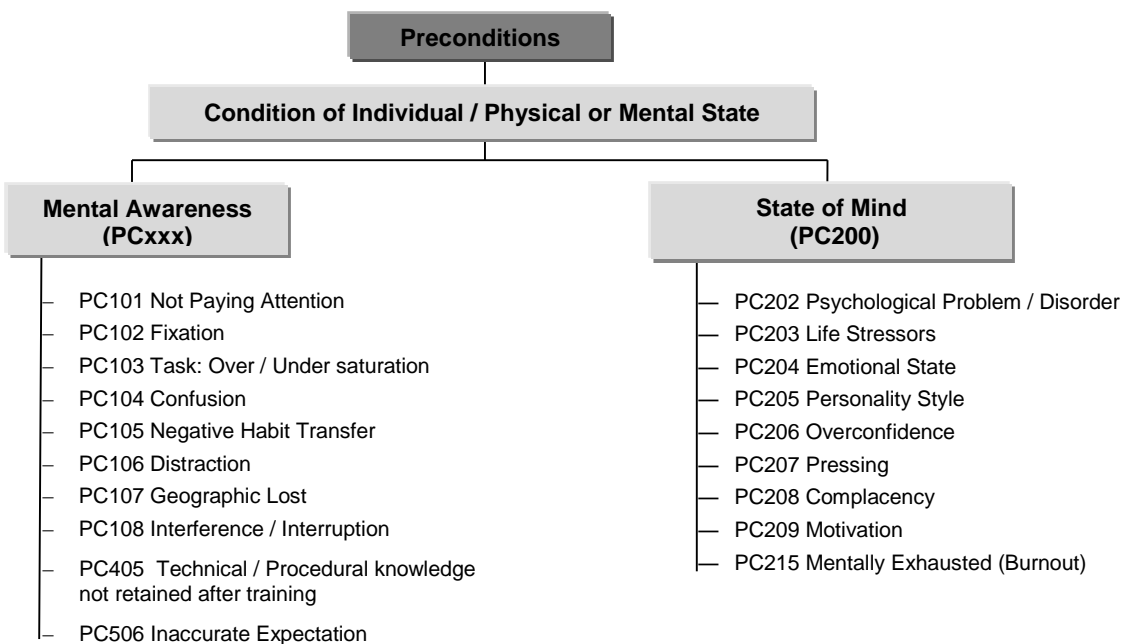


Table 2b. Preconditions - Conditions of the Individual

Preconditions - Condition of Individuals

Mental Awareness (Cognitive Factors): Are factors in a mishap if cognitive or attention management conditions affect the perception or performance of individuals.

- **PC101 Not Paying Attention:** is a factor when there is a lack of state of alertness or a readiness to process immediately available information. The individual has a state of reduced conscious attention due to a sense of security, self-confidence, boredom or a perceived absence of threat from the environment. This may often be a result of highly repetitive tasks.
- **PC102 Fixation:** is a factor when the individual is focusing all conscious attention on a limited number of environmental cues to the exclusion of others.
- **PC103 Task Over-Saturation / Under-Saturation:** is a factor when the quantity of information an individual must process exceeds their mental resources in the amount of time available to process the information.

- **PC104 Confusion:** is a factor when the individual is unable to maintain a cohesive and orderly awareness of events and required actions and experiences a state characterized by bewilderment, lack of clear thinking or (sometimes) perceptual disorientation.
- **PC105 Negative Habit Transfer:** is a factor when the individual reverts to a highly learned behavior used in a previous system or situation and that response is inappropriate for current task demands.
- **PC106 Distraction:** is a factor when the individual has an interruption of attention and/or inappropriate redirection of attention by an environmental cue or mental process.
- **PC107 Geographically Lost:** is a factor when the individual is at a different location from where one believes they are.
- **PC108 Interference / Interruption:** is a factor when an individual is performing a highly automated/learned task and is distracted by another cue/event that results in the interruption and subsequent failure to complete the original task or results in skipping steps in the original task.
- **PC405 Technical or Procedural Knowledge Not Retained after Training:** is a factor when the individual fails to absorb/retain required information or is unable to recall past experience needed for safe task completion.
- **PC506 Inaccurate Expectation:** is a factor when the individual expects to perceive a certain reality and those expectations are strong enough to create a false perception of the expectation.

State of Mind (Psycho-Behavioral Factors): Are factors when an individual's personality traits, psychosocial problems, psychological disorders or inappropriate motivation creates an unsafe situation.

- **PC202 Psychological Problem:** is a factor when the individual met medical criteria for a psychiatric disorder.
- **PC203 Life Stressors:** is a factor when the individual's performance is affected by life circumstance problems (includes relationship issues, financial stressors, recent move, etc.).
- **PC204 Emotional State:** is a factor when the individual is under the influence of a strong positive or negative emotion and that emotion interferes with duties.
- **PC205 Personality Style:** is a factor when the individual's personal interaction with others creates an unsafe situation. Examples are authoritarian, over-conservative, impulsive, invulnerable, submissive or other personality traits that result in degraded performance.
- **PC206 Overconfidence:** is a factor when the individual overvalues or overestimates personal capability, the capability of others or the capability of aircraft/vehicles or equipment.
- **PC207 Pressing:** is a factor when the individual knowingly commits to a course of action that excessively presses the individual and/or their equipment beyond reasonable limits (e.g., pushing self or equipment too hard).
- **PC208 Complacency:** is a factor when the individual has a false sense of security, is unaware of, or ignores hazards and is inattentive to risks.
- **PC209 Motivation:** is a factor when the individual's motivation to accomplish a task/mission is excessive, weak, indecisive or when personal goals supersede the organization's goals.
- **PC215 Mentally Exhausted (Burnout):** is a factor when the individual has the type of exhaustion associated with the wearing effects of high operational and/or lifestyle tempo in which operational requirements impinge on the ability to satisfy personal requirements and leads to degraded effectiveness.

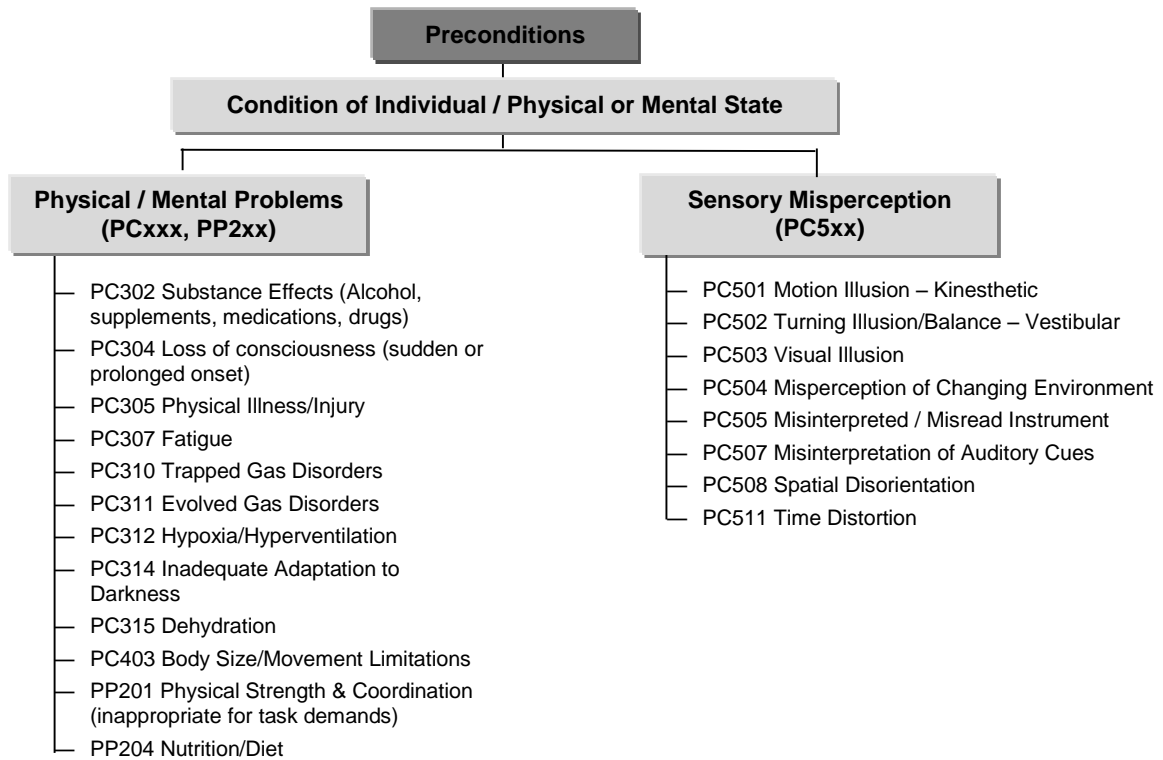


Table 2c. Conditions of individuals

Preconditions - Condition of Individuals

Physical Problems: Are factors when an individual experiences a physiologic event that compromises human performance and this decreases performance and results in an unsafe situation.

- **PC302 Substance Effects (alcohol, supplements, medications, drugs):** is a factor when the individual uses legal or illegal drugs, supplements, energy drinks, or any other substance with measurable effect that interferes with performance.
- **PC304 Loss of Consciousness (sudden or prolonged onset):** is a factor when the individual has a loss of functional capacity/consciousness due to G-LOC, seizure, trauma or any other cause.
- **PC305 Physical Illness / Injury:** is a factor when a physical illness, injury, deficit or diminished physical capability causes an unsafe situation. This includes pre-existing and operationally-related medical conditions, over-exertion, motion sickness, etc.
- **PC307 Fatigue:** is a factor causing diminished physical / mental capability resulting from chronic or acute periods of prolonged wakefulness, sleep deprivation, jet lag, shift work or poor sleep habits.
- **PC310 Trapped Gas Disorders:** is a factor when gasses in the middle ear, sinuses, teeth or intestinal tract expand or contracts. Also capture alternobaric (*dizziness from unequal pressures*) vertigo for diving or aviation under this code.
- **PC311 Evolved Gas Disorders:** is a factor when inert-gas evolves in the blood causing an unsafe situation. This includes chokes, CNS, bends, paresthesia (*a sensation of pricking, tingling, or creeping on the skin*) or other conditions caused by inert-gas evolution.

- **PC312 Hypoxia / Hyperventilation:** is a factor when the individual has insufficient oxygen supply to the body and/or breathing above physiological demands causes impaired function.
- **PC314 Inadequate Adaptation to Darkness:** is a factor when the normal human limitation of dark-adaptation rate affects safety, for example, when transitioning between aided and unaided night vision.
- **PC315 Dehydration:** is a factor when the performance of the individual is degraded due to dehydration as a result of excessive fluid losses due to heat stress or due to insufficient fluid intake.
- **PC403 Body Size / Movement Limitations:** is a factor when the size, strength, dexterity, mobility or other biomechanical limitations of an individual creates an unsafe situation. It must be expected that the average individual qualified for that duty position could accomplish the task in question.
- **PP201 Physical Strength & Coordination (inappropriate for task demands):** is a factor when the relative physical strength and/or coordination of the individual is not adequate to support task demands.
- **PP204 Nutrition/Diet:** is a factor when the individual's nutritional state or poor dietary practices are inadequate to fuel the brain and body functions resulting in degraded performance.

Sensory Misperception: are factors resulting in degraded sensory inputs (visual, auditory or vestibular) that create a misperception of an object, threat or situation.

- **PC501 Motion Illusion – Kinesthetic:** is a factor when physical sensations of the ligaments, muscles or joints cause the individual to have an erroneous perception of orientation, motion or acceleration. (If this illusion leads to spatial disorientation you must code PC508.)
- **PC502 Turning/Balance Illusion – Vestibular:** is a factor when stimuli acting on the balance organs in the middle ear cause the individual to have an erroneous perception of orientation, motion or acceleration. (If this illusion leads to spatial disorientation you must code PC508.)
- **PC503 Visual Illusion:** is a factor when visual stimuli result in an erroneous perception of orientation, motion or acceleration. (If this illusion leads to spatial disorientation you must code PC508.)
- **PC504 Misperception of Changing Environment:** is a factor when an individual misperceives or misjudges altitude, separation, speed, closure rate, and road / sea conditions, or vehicle / aircraft location within the performance envelope or other operational conditions.
- **PC505 Misinterpreted / Misread Instrument:** is a factor when the individual is presented with a correct instrument reading but its significance is not recognized, it is misread or is misinterpreted.
- **PC507 Misinterpretation of Auditory / Sound Cues:** is a factor when the auditory inputs are correctly interpreted but are misleading/disorienting or, when the inputs are incorrectly interpreted and cause an impairment of normal performance.
- **PC508 Spatial Disorientation:** is a factor when an individual fails to correctly sense a position, motion or attitude of the aircraft/vehicle/vessel or of oneself. Spatial Disorientation may be unrecognized and/or result in partial or total incapacitation.
- **PC511 Temporal / Time Distortion:** is a factor when the individual experiences a compression or expansion of time relative to reality. This is often associated with a “fight or flight” response.

Preconditions - Personnel Factors: Personnel factors are factors in a mishap if crew resource management affects practices, conditions or actions of individuals, and result in human error or an unsafe situation.

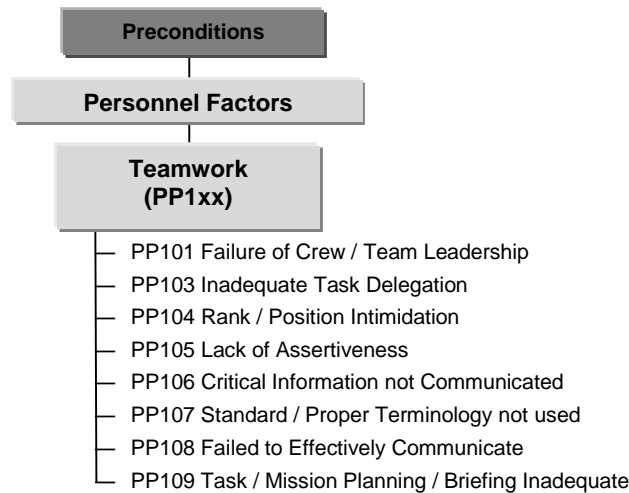


Table 2d. Personal Factors

Teamwork: Refer to interactions among individuals, crews, and teams involved with the preparation and execution of a mission that resulted in human error or an unsafe situation.

- **PP101 Failure of Crew / Team Leadership:** is a factor when the crew/team leadership techniques failed to facilitate a proper crew/team climate, to include establishing and maintaining an accurate and shared understanding of the evolving task and plan on the part of all crew/team members.
- **PP103 Inadequate Task Delegation:** is a factor when the crew/team members failed to actively manage the distribution of tasks to prevent the overloading of any individual member.
- **PP104 Rank / Position Intimidation:** is a factor when the differences in rank of the team/crew caused the task performance capabilities to be degraded. Also, conditions where formal or informal authority gradient is too steep or too flat across a crew/team and this condition degrades collective or individual performance.
- **PP105 Lack of Assertiveness:** is a factor when an individual failed to state critical information or solutions with appropriate persistence and/or confidence.
- **PP106 Critical Information Not Communicated:** is a factor when known critical information was not provided to appropriate individuals in an accurate or timely manner.
- **PP107 Standard / Proper Terminology Not Used:** is a factor when clear and concise terms, phrases, hand signals, etc. per service standards and training were not used.
- **PP108 Failed to Effectively Communicate:** is a factor when communication is not understood or is misinterpreted as the result of behavior of either sender or receiver. Communication failed to include backing up, supportive feedback or acknowledgement to ensure that personnel correctly understood announcements or directives.
- **PP109 Task/Mission Planning/Briefing Inadequate:** is a factor when an individual, crew or team failed to complete all preparatory tasks associated with planning/briefing the task/mission.

3. Unsafe Supervision: Supervision is a factor in a mishap if the methods, decisions or policies of the supervisory chain of command directly affect practices, conditions or actions of the individual(s). The DoD Human Factors Working Group has determined that a mishap event can often be traced back to the supervisory chain of command. Unsafe Supervision divided into three major categories as follows:

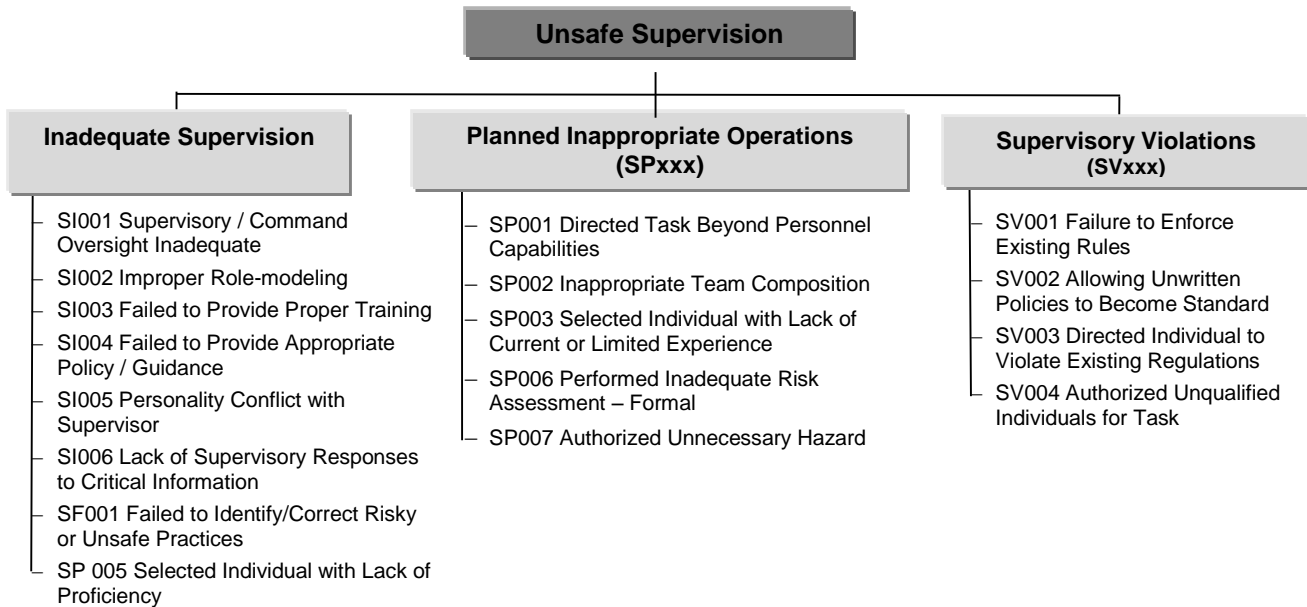


Table 3. Categories of Unsafe Supervision

Inadequate Supervision: are factors when section / department / platoon level or unit / command level supervision proves inappropriate or improper and/or fails to identify hazards, recognize and control risk, provide guidance, training and/or oversight and results in human error or an unsafe situation.

The role of supervisors is to provide their personnel with the opportunity to succeed. To do this, supervisors must provide guidance, training opportunities, leadership, motivation, and the proper role model, regardless of their supervisory level. Unfortunately, this is not always the case. It is easy to imagine a situation where adequate Risk Management training was not provided to an operator or team member. Conceivably, the operator's coordination skills would be compromised, and if put into a non-routine situation (e.g., emergency), would be at risk for errors that might lead to a mishap. Therefore, the category Inadequate Supervision accounts for those times when supervision proves inappropriate, improper, or may not occur at all (see Table 3).

- **SI001 Supervisory / Command Oversight Inadequate:** is a factor when the availability, competency, quality or timeliness of leadership, supervision or oversight does not meet task demands. *Inappropriate supervisory pressures are also captured under this code.*
- **SI002 Improper Role-Modeling:** is a factor when the individual's learning is influenced by the behavior of supervisors and when that learning manifests itself in actions that are either inappropriate to the individual's skill level or violate standard procedures.

- **SI003 Failed to Provide Proper Training:** is a factor when one-time or recurrent training programs, upgrade programs, transition programs or any other local training is inadequate or unavailable, etc. *(Note: the failure of an individual to absorb the training material in an adequate training program does not indicate a training program problem.)*
- **SI004 Failed to Provide Appropriate Policy / Guidance:** is a factor when policy/guidance or lack of a policy/guidance leads to an unsafe situation.
- **SI005 Personality Conflict with Supervisor:** is a factor when a supervisor and individual member experience a "personality conflict" that leads to a dangerous error in judgment/action.
- **SI006 Lack of Supervisory Responses to Critical Information:** is a factor when information critical to a potential safety issue was provided but supervisory/management personnel failed to act upon it *(failure to close the loop)*.
- **SF001 Failed to Identify / Correct Risky or Unsafe Practices:** is a factor when a supervisor fails to identify or correct risky behaviors or unsafe tendencies and/or fails to institute remedial actions. This includes hazardous practices, conditions or guidance.
- **SP005 Selected Individual with Lack of Proficiency:** is a factor when a supervisor selects an individual that is not proficient in a task, mission or event.

Planned Inappropriate Operations: Is a factor in a mishap when supervision fails to adequately assess the hazards associated with an operation and allows for unnecessary risk.

It is also a factor when supervision allows non-proficient or inexperienced personnel to attempt missions beyond their capability or when crew or flight makeup is inappropriate for the task or mission.

Occasionally, the operational tempo or schedule is planned such that individuals are put at unacceptable risk, crew rest is jeopardized, and ultimately performance is adversely affected. Such "Planned Inappropriate Operations", though arguably unavoidable during emergency situations, are not acceptable during normal operations.

Included in this category are issues of crew pairing and improper manning. For example, it is not surprising to anyone that problems can arise when two individuals with marginal skills are paired together. During a period of downsizing and/or increased levels of operational commitment, it is often more difficult to manage crews. However, pairing weak or inexperienced operators together on the most difficult missions may not be prudent

- **SP001 Directed Task Beyond Personnel Capabilities:** is a factor when supervisor/management directs personnel to undertake a task beyond their skill level or beyond the capabilities of their equipment.
- **SP002 Inappropriate Team Composition:** is a factor when the makeup of the crew/team should have reasonably raised safety concerns in the minds of members involved in the task, or in any other individual directly related to the scheduling of this task.
- **SP003 Selected Individual with Lack of Current or Limited Experience:** is a factor when the supervisor selects an individual whose experience is not sufficiently current or proficient to permit safe task execution.
- **SP006 Performed Inadequate Risk Assessment – Formal:** is a factor when supervision does not adequately evaluate the risks associated with a task or when pre-mission risk assessment tools/programs are inadequate.
- **SP007 Authorized Unnecessary Hazard:** is a factor when supervision authorizes an activity or task that is unnecessarily hazardous without sufficient cause or need.

Supervisory Violations: Is a factor in a mishap when supervision willfully disregards instructions, guidance, rules, or operating instructions and this lack of supervisory responsibility creates an unsafe situation.

For instance, a supervisor knowingly permits an individual to operate a vehicle or piece of equipment without being qualified is a flagrant violation that invariably sets the stage for the tragic sequence of events that predictably follow.

- **SV001 Failure to Enforce Existing Rules (supervisory act of omission):** is a factor when unit (organizational) and operating rules have not been enforced by a supervisor
- **SV002 Allowing Unwritten Policies to Become Standard:** is a factor when unwritten or “unofficial” policy is perceived and followed by the individual, although it has not been formally recognized by the organization.
- **SV003 Directed Individual to Violate Existing Regulations:** is a factor when a supervisor directs a subordinate to violate existing regulations, instructions or technical guidance.
- **SV004 Authorized Unqualified Individuals for Task:** is a factor when an individual has not met the general training requirements for the job/weapon system and is considered non-current but supervision/leadership inappropriately allows the individual to perform the task for which the individual is non-current.

4. Organizational Influences: Are factors in a mishap where “command level” and/or “upper-level management” may have contributed to the mishap. Fallible decisions of upper-level management directly affect supervisory practices, as well as the conditions and actions of operators. These latent conditions generally involve issues related to *Problems with Resource / Acquisition Management, Personnel Selection and Training issues, Organizational Climate influences, and Policy and Processes issues.*

Did policies, communications, actions, or omissions of upper-level management directly or indirectly affect supervisory practices, conditions, or actions of the operator(s) and result in system failure?

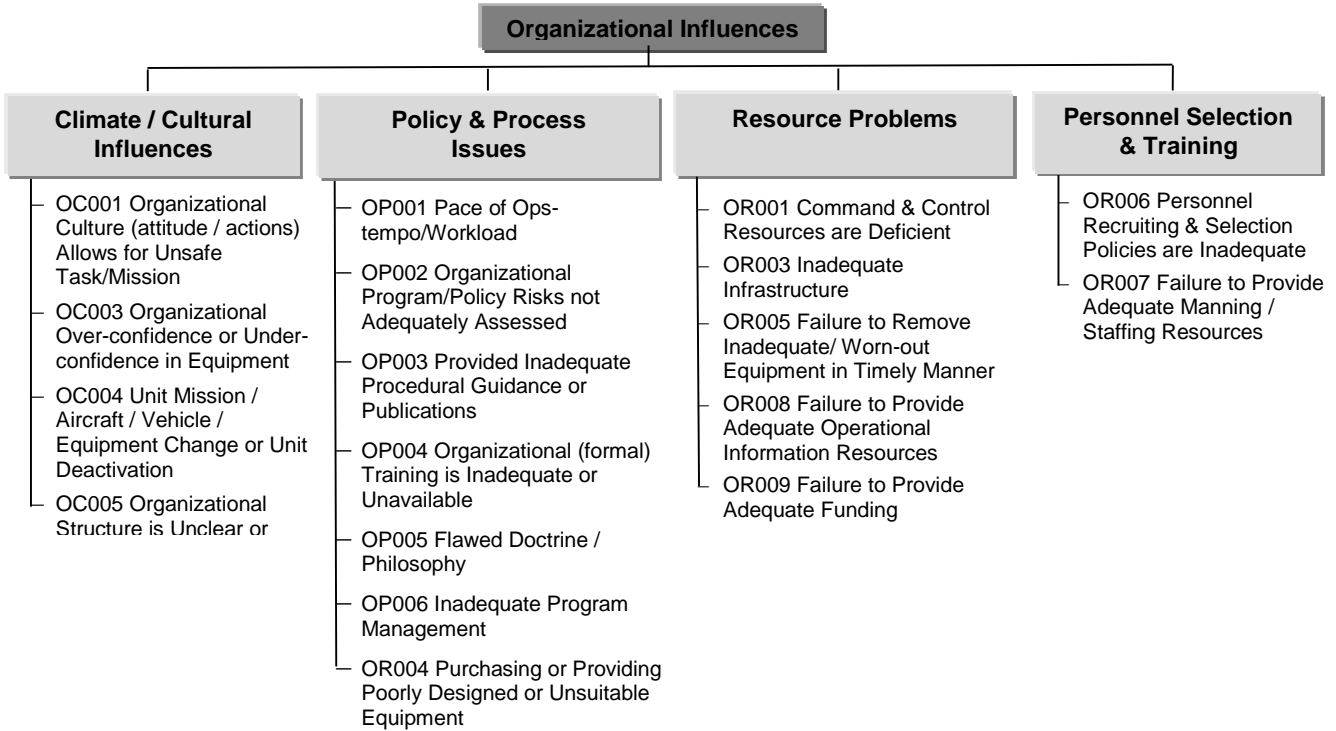


Table 4. Categories of Organizational Influences

Organizational Climate / Culture Influences: Are factors where the working atmosphere within the organization influences individual actions resulting in human error. (E.g. command structure, policies, and working environment). *Organizational Climate* refers to a broad class of organizational variables that influence worker performance. It can be defined as the situational consistencies in the organization's treatment of individuals. In general, Organizational Climate is the prevailing atmosphere or environment within the organization. Within the present classification system, climate is broken down into three categories--structure, policies, and culture.

The term “structure” refers to the formal component of the organization. The “form and shape” of an organization are reflected in the chain-of-command, delegation of authority and responsibility, communication channels, and formal accountability for actions. Organizations with maladaptive structures (i.e., those that do not optimally match to their operational environment or are unwilling to change) will be more prone to mishaps.

“Policies” refer to a course or method of action that guides present and future decisions. Policies may refer to hiring and firing, promotion, retention, raises, sick leave, drugs and alcohol, overtime, mishap investigations, use of safety equipment, etc. When these policies are ill-defined, adversarial, or conflicting, safety may be reduced.

Finally, “culture” refers to the unspoken or unofficial rules, values, attitudes, beliefs, and customs of an organization (“*The way things really get done around here.*”). Other issues related to culture include organizational justice, psychological contracts, organizational citizenship behavior, *esprit de corps*, and union / management relations. All these issues affect attitudes about safety and the value of a safe working environment.

- **OC001 Organizational Culture (attitude/actions) Allows for Unsafe Task/Mission:** a factor when explicit/implicit actions, statements or attitudes of unit leadership set unit/organizational values (culture) that allow an environment where unsafe task/mission demands or pressures exist.
- **OC003 Organizational Over-confidence or Under-confidence in Equipment:** is a factor when there is organizational over- or under-confidence in an aircraft, vehicle, device, system or any other equipment.
- **OC004 Unit Mission/Aircraft/Vehicle/Equipment Change or Unit Deactivation:** is a factor when the process of changing missions, aircraft/vehicle/equipment or an impending unit deactivation creates an unsafe situation.
- **OC005 Organizational Structure is Unclear or Inadequate:** is a factor when the chain of command of an individual or structure of an organization is confusing, non-standard or inadequate and this creates an unsafe situation.

Organizational Policy and Processes Issues: Are factors if organizational processes negatively influence performance and result in an unsafe situation or human error. This includes operational risk management practices, procedures, and oversights which negatively influence individual, supervisory, and/or team performance and results in unrecognized hazards and/or uncontrolled risk.

This category refers to the formal process by which “*things get done*” in the organization. It is subdivided into three broad categories--operations, procedures, and oversight. T

The term “*operations*” refers to the characteristics or conditions of work that have been established by management. These characteristics include operational tempo, time pressures, production quotas, incentive systems, and schedules. When set up inappropriately, these working conditions can be detrimental to safety.

“*Procedures*” are the official or formal procedures as to how the job is to be done. Examples include performance standards, objectives, documentation, and instructions about procedures. All of these, if inadequate, can negatively impact employee supervision, performance, and safety.

Finally, “*oversight*” refers to monitoring and checking of resources, climate, and processes to ensure a safe and productive work environment. Issues here relate to organizational self-study, risk management, and the establishment and use of safety programs.

- **OP001 Pace of Ops-tempo/Workload:** is a factor when the pace of deployments, workload, additional duties, off-duty education, PME or other workload-inducing conditions of an individual or unit creates an unsafe situation.
- **OP002 Organizational Program/Policy Risks not Adequately Assessed:** is a factor when the potential risks of a large program, operation, acquisition or process are not adequately assessed and this inadequacy.
- **OP003 Provided Inadequate Procedural Guidance or Publications:** is a factor when written direction, checklists, graphic depictions, tables, charts or other published guidance is inadequate, misleading or inappropriate.
- **OP004 Organizational (formal) Training is Inadequate or Unavailable:** is a factor when one-time or initial training programs, upgrade programs, transition programs or other training that is conducted outside the local unit is inadequate or unavailable, etc.

- **OP005 Flawed Doctrine/Philosophy:** is a factor when the doctrine, philosophy or concept of operations in an organization is flawed or accepts unnecessary risk which leads to an unsafe situation or unmitigated hazard.
- **OP006 Inadequate Program Management:** is a factor when programs are implemented without sufficient support, oversight or planning.
- **OR004 Purchasing or Providing Poorly Designed or Unsuitable Equipment:** is a factor when the processes through which aircraft, vehicle, equipment or logistical support are acquired allows inadequacies or when design deficiencies allow inadequacies in the acquisition.

Resource Problems: Is a factor 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.

- **OR001 Command and Control Resources are Deficient:** is a factor when installation resources are inadequate for safe operations. Examples include: command and control, airfield services, battle-staff or battle-group management, etc.
- **OR003 Inadequate Infrastructure:** is a factor when support facilities (dining, exercise, quarters, medical care, etc.) or opportunity for recreation or rest are not available or adequate. This includes situations where leave is not taken for reasons other than the individual's choice.
- **OR005 Failure to Remove Inadequate/Worn-Out Equipment in a Timely Manner:** is a factor when the process through which equipment is removed from service is inadequate.
- **OR008 Failure to Provide Adequate Operational Information Resources:** is a factor when weather, intelligence, operational planning material or other information necessary for safe operations planning are not available.
- **OR009 Failure to Provide Adequate Funding:** is a factor when an organization or operation does not receive the financial resources to complete its assigned task/mission.

Personnel Selection & Training: 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.

- **OR006 Personnel Recruiting and Selection Policies are Inadequate:** is a factor when the process through which individuals are screened, brought into the service or placed into specialties is inadequate.
- **OR007 Failure to Provide Adequate Manning/Staffing Resources:** is a factor when the process through which manning, staffing or personnel placement or manning resource allocations are inadequate for task/mission demands.