Human Factors Accident and Incident Analysis

Sensory and Perceptual Factors
- Misjudgment of distance, clearance, speed, and so forth
- False perception caused by visual illusion. Conditions that impair visual performance:
  - Featureless terrain (such as a desert, dry lake, water, snow).
  - Darkness and poor visibility.
  - Smoke and changing smoke patterns.
  - Mountainous terrain or sloping runway.
  - Anomalous light effects that cause flicker vertigo.
  - Low contrast of objects to background or poor illumination.
  - View into bright sunlight or moonlight.
  - Shadows.
  - Whiteout snow conditions.
- Spatial disorientation and vertigo. Conditions that affect sense of body position:
  - Loss of visual cues.
  - Adverse medical condition or physiological condition (alcohol and drug effects, hangover, dehydration, fatigue, and so forth).
  - Moving head up and down, looking in and out to change radios, answering or using cell phones.
- Loss of situational awareness. Types:
  - Geographic disorientation (such as deviation from route, loss of position awareness).
  - General loss of situational awareness (such as failure to perceive hazardous condition).
  - Erroneous situational assessment (misinterpretation of situation or condition).
  - Failure to predict or anticipate changing conditions.
  - False hypothesis confirmation bias (persistent false perception or misconception of situation).
- Attention failure (such as failure to monitor or respond when correct information is available). Types:
  - Failure to visually scan outside the vehicle or equipment for hazards.
  - Omission of checklist items.
  - Failure to respond to communication or warning.
  - Control-action error:
    - Failure to set, move, or reset control switch lapse.
    - Unintentional activation of control switch (slip).
    - Control-substitution error (slip).
    - Control-reversal error (slip).
    - Control-adjustment or precision error (slip).
- Conditions that affect attention and situational awareness:
  - Inattention (focus on information unrelated to tasks).
  - Channelization, fixation (psychological narrowing of perception).
  - Distraction (preoccupation with internal [mental] event or with external event).
  - Task overload due to systems (such as communications).
  - Task overload due to equipment systems assignment factors.
  - Cognitive workload (problem-solving concentration or information overload).
  - Habit influence or interference.
  - Excessive crew stress or fatigue.
  - Excessive workload or tasking.
  - Inadequate briefing or preparation.
  - Inadequate training or experience for assignment.
  - Negative learning transfer (such as during transition to new assignment).
  - Adverse meteorological conditions
  - Tactical-situation overload or display-information overload.
  - Inadequate crew motivation or inadequate vigilance.
  - Inadequate equipment design.

Medical and Physiological Factors
- Carbon monoxide poisoning.
- Self-medication (without medical advice or against medical advice).
- Motion sickness.
- Incompatible physical capabilities.
- Overexertion while off duty.
- Influence of drugs or alcohol.
- Cold or flu (or other known illness).
- Excessive personal stress or fatigue.
- Inadequate nutrition (such as omitted meals).
- Hypoxia.
- Heat.
- Cold.
- Stress induced by heightened state of alertness.
- Affects of smoke.
- Dehydration.
- Other medical or physiological condition.
- Conditions that may cause adverse medical or physiological state:

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Assignment Factors
- Failure of dispatch to provide correct critical information (such as frequencies, location, other equipment, or resources).
- Poor communication with other assets (such as ground or aircraft).
- Inadequate or faulty supervision from ground or tactical aircraft.
- Lack or variation of standards.
- Nonparticipant or noncommunicative equipment or resources at the scene.
- Loss of situational awareness in varying environment.
- Changing plans or tactics (change of teams on incidents).
- Unanticipated change of radio frequencies.
- Intentional deviation from procedures.
- Unintentional deviation from procedures.
- Demonstration of performance below required proficiency standards or current standards.
- Demonstration of inadequate performance or documented deficiencies.
- Inadequate essential training for specific task(s).
- Inadequate recent experience or inadequate experience for assignment.
- Transition (learning new equipment or operational systems).
- Inadequate knowledge of tactical situation.
- Lack of sensory input.
- Limited reaction time.
- Conditions that lead to inadequate assignment performance.
  - Smoke.
  - Wind shifts.
  - Changes in fire behavior.
  - Low visibility.
  - Unexpected equipment, resources, or aircraft.
  - Assignment intensity.
  - Assignment creep.
  - Assignment urgency.
  - Failure to recognize deteriorating conditions.
  - Time compression.
  - Diverts to new incidents.
  - Excessive communication demands.
  - Past assignment success based on high-risk behavior.

Knowledge and Skill Factors
- Inadequate knowledge of systems, procedures, and so forth (knowledge-based errors). Types:
  - Knowledge-based.
  - Inadequate knowledge of systems, procedures.
  - Used improper procedure.
  - Ill-structured decisions.
  - Failure in problem solving.
- Inadequate equipment control, or inadequate accuracy and precision of equipment maneuvering (skill-based error). Types:
  - Breakdown in visual scan.
  - Failure to see and avoid.
  - Over or under reacting.
  - Over or under controlling.
  - Inadequate experience for complexity of assignment.
- Misuse of procedures or incorrect performance tasks (rule-based error), such as:
  - Failure to perform required procedure.
  - Use of wrong procedure or rule(s).
  - Failure to conduct step(s) in prescribed sequence.
- Conditions that lead to inadequate operational performance:
  - Lack or variation of standards.
  - Loss of situational awareness in varying environment.
  - Demonstration of performance below required proficiency standards or current standards.
  - Demonstration of inadequate performance or documented deficiencies.
  - Inadequate essential training for specific task(s).
  - Inadequate recent experience or inadequate experience.
  - Lack of sensory input.
  - Limited reaction time.

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Personality and Safety Attitude
- Overconfidence.
- Excessive motivation to achieve assignment.
- Reckless operation.
- Anger or frustration on the job.
- Stress-coping failure (such as anger).
- Overly assertive or nonassertive.
- Inadequate confidence to perform tasks or activities.
- Acquiescence to social pressure (from organization or peers) to operate in hazardous situation or condition.
- Failure to report or act upon incidents of misconduct.
- Tolerance of unsafe acts and behaviors.
- Poor equipment or assignment preparation.

Judgment and Risk Decision
- Acceptance of a high-risk situation or assignment.
- Misjudgment of assignment risks (complacency).
- Failure to monitor assignment progress or conditions (Complacency).
- Use of incorrect task priorities.
- Intentional deviation from safe procedure (imprudence).
- Intentional violation of standard operating procedure or regulation. Types:
  - Violation of orders, regulations, standard operating procedures (SOP).
  - Crew rest requirements.
  - Inadequate training.
  - Violated agency policy or contract.
  - Failed to comply with agency manuals.
  - Supervisor knowingly accepted unqualified crew.
  - Failed to obtain valid weather brief.
  - Accepted unnecessary hazard.
  - Lacks adequate of up-to-date qualifications for assignment.
- Intentional disregard of warnings.
- Noncompliance with personal limits.
- Noncompliance with published equipment limits.
- Noncompliance with prescribed assignment parameters.
- Acquiescence to social pressure (from organization or peers).
- Conditions leading to poor safety attitude and risky judgment:
  - History of taking high risks (personality-driven).
  - Pattern of overconfidence.
  - Personal denial of wrongdoing.
  - Documented history of marginal performance or failure.
  - Excessive motivation (did not know limits).
  - Reputation as a reckless individual.
  - Failure to cope with life stress (anger or frustration).
  - Overly assertive or nonassertive (interpersonal style).
  - Influenced by inadequate organizational climate or safety culture (such as lack of adequate supervision).

Communication and Crew Coordination
- Inadequate assignment plan or brief.
- Inadequate or wrong assignment information conveyed to crew (dispatch or supervisor errors).
- Failure to communicate plan or intentions.
- Failure to use standard or accepted terminology.
- Failure to work as a team.
- Inability or failure to contact and coordinate with ground or aviation personnel.
- Inadequate understanding of communication or failure to acknowledge communication.
- Interpersonal conflict or crew argument during assignment.
- Conditions leading to inadequate communication or coordination:
  - Inadequate training in communication or crew coordination.
  - Inadequate standard operating procedures for use of crew resources.
  - Inadequate support from organization for crew-coordination doctrine.
  - Failure of organizational safety culture to support crew resource management.

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**System Design and Operation Factors**
- Use of wrong switch, lever, or control.
- Misinterpretation of instrument indication.
- Inability to reach or see control.
- Inability to see or interpret instrument or indicator.
- Failure to respond to warning.
- Selection or use of incorrect system-operating mode (mode confusion).
- Overreliance on automated system (automation complacency).
- Conditions that contribute to design-induced crew errors:
  - Inadequate primary equipment control or display arrangement.
  - Inadequate primary display data or data format.
  - Inadequate hazard advisory or warning display.
  - Inadequate system instructions or documentation.
  - Inadequate system support or facilities.
  - Inappropriate type or level of automation, or excessive mode complexity.
- Failure to correct inappropriate behavior.
- Failure to correct a safety hazard.
- Failure to establish or monitor quality standards.
- Failure of standards, either poorly written, highly interpretable, or conflicting.
- Risk outweighs benefit.
- Poor crew pairing
- Excessive assignment tasking or workload.
- Inadequate assignment briefing or supervision.
- Intentional violation of a standard or regulation.
- Failure to perceive or to assess (correctly) assignment risks, with respect to:
  - Unseen or unrecognized hazards.
  - Environmental hazards or operating conditions.
  - Assignment tasking and crew skill level.
  - Equipment limitations.
- Conditions leading to supervisory failures:
  - Excessive operations or organizational workload (imposed by the organization or imposed by organizational chain).
  - Inadequate organizational safety culture.
  - Supervisor is over-tasked.
  - Supervisor is untrained.
  - Inattention to safety management (inadequate safety supervision).
  - Inadequate work standards or low performance expectations.
  - Inadequate or poor example set by supervisors.
  - Inadequate safety commitment or emphasis by supervisors.
  - Organization lacks an adequate system for monitoring and correcting hazardous conditions.
  - Supervisors fail to promote and reward safe behavior or quickly correct unsafe behavior.
  - Organization lacks adequate policies and procedures to ensure high quality work performance.

**Supervisory and Organizational Factors**
- Not adhering to rules and regulations.
- Inappropriate scheduling or crew assignment.
- Failure to monitor crew rest or duty requirements.
- Failure to establish adequate standards.
- Failure to provide adequate briefing for assignment.
- Failure to provide proper training.
- Lack of professional guidance.
- Undermining or failure to support crews.
- Failure to monitor compliance with standards.
- Failure to monitor crew training or qualifications.
- Failure to identify or remove a known high-risk employee.
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— Organization lacks adequate job-qualification standards or training program.
— Organization lacks adequate internal communication.
— Organization had no system or an inadequate system for management of high-risk employees.
— Organization lacks adequate process or procedures for operational risk management.
— Organization fails to provide adequate human factors training.
— Organization fails to ensure sufficient involvement of medical and occupational health specialists.
— Understaffed.
— Ineffective organization of assigned personnel.

Maintenance

• Procedures.
  — Unwritten.
  — Unclear, undefined, or vague.
  — Not followed.
• Records.
  — Discrepancies entered but not deferred or cleared.
  — Entries not recorded or not recorded in correct books(s).
  — Improper entries or unauthorized signature or number.
  — Falsification of entries.
• Publications, manuals, guides.
  — Not current.
  — Were unused for the procedure.
  — Incorrect manual or guide used for procedure.
  — Not available.

• Training
  — Not trained for the special equipment or tool.
  — Training not documented.
  — Falsified.
  — Not current.
• Personnel.
  — Not properly licensed.
  — Insufficient (staffing).
  — Improper or insufficient oversight.
  — Not properly rested
• Management.
  — Nonexistent.
  — Ineffective.
  — Understaffed.
  — Ineffective organization of assigned personnel.
  — Insufficiently trained
• Quality assurance.
  — Nonexistent.
  — Insufficiently trained
  — Ineffective.
  — Not used when available.
• Inspection guides.
  — Unavailable.
  — Procedures not followed.
  — Insufficient.
  — Not current.
  — Not approved.
  — Not signed off.
  — Falsified.
  — Unapproved signature or number.
• Tools or equipment.
  — Improper use or procedure.
  — Uncalibrated.
  — Used improperly.
  — Not trained for the special equipment or tool.
  — Not used.
  — No tool control program.