Appendix 7 – Human Factors Accident and Incident Analysis Checklist Summary

USDA Forest Service Serious Accident Investigation Guide (2005)

It is widely published and recognized that the adverse effects of human error on decision making and risk perception are primary causes or contributors to serious accidents. Unsafe acts and human error associated with a majority of accidents also involve powerful latent preconditions and influences involving supervision and organization. Current safety investigation processes and prescribed interview protocols should not be expected to provide a "full and frank" revelation and analysis of the complex underlying psychological and physiological human factors that can compromise safe decisions and behavior. However, the following human factors analysis checklist provides a subjective, unweighed glance at the scope and complexity of human factors likely involved in the Esperanza incident. A √ mark means that the condition was present by some or all personnel assigned to the incident.

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 effect 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 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.

    - ❑ Assignment tasking or job fatigue (such as being on duty more than 14 hours, late-night or early-morning operations).
    - ❑ Cumulative fatigue (such as excessive physical or mental workload, circadian disruption, or sleep loss).
    - ❑ Cumulative effects of personal or occupational stress (beyond stress-coping limit).

    - ✓ Emergency condition or workload transition (from normal operation to emergency operation).

- ❑ Medical or physiological preconditions (health and fitness, hangover, dehydration, and so forth).

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.

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.

- ❑ Non-participant or non-communicative 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.

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.
- ❑ Toleration 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 current 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 high risk taking).

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.

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.

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.
- ❑ 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 safe work performance.

  ❑ 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.
❑ Organization fails to establish or enforce acceptable medical or health standards.

Written Plans, Direction, and Documentation

- Procedures.

  ❑ Unwritten.

  ✓ Unclear, undefined, or vague.

  ❑ Not followed.

- Records.

  ❑ Discrepancies entered but not deferred or cleared.
  ❑ Entries not recorded or not recorded in correct book(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 on procedure.
  ❑ 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.