# Human Factors Checklist

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# Sensory-Perceptual Factors

- Misjudged distance, clearance, altitude, speed, etc…
- False Perceptions due to visual illusion
  - Contributory conditions:
    - Featureless terrain (desert, water, dry lakebed)
    - Dark
    - Black hole approach
    - No/false horizon
    - Mountainous terrain or sloping runway
    - Rotor downwash effects

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- Anomalous light effects
- Low contrast object or poor illumination
- Looking into bright sun or shadows

- False perception due to vestibular illusions
  - Coriolis cross coupling (spining sensation due to vestibular overstimulation)
  - Somatogravic (g induced false pitch up or down)
  - Somatogyral (false sensation of angular rotation)
  - G excess ( error in perceiving actual angel of bank)

- Spatial Disorientation/Vertigo
  - Type I: Unrecognized or misoriented (loss of attitudnal orientation without awareness)
  - Type II: Recognized (vertigo or the leans)
  - Type III: Incapacitating (e.g. g-induced vestibular-ocular coupling)

    - Conditions that affect sense of body position or aircraft attitude:

    1. Loss of visual cues/attitude references
    2. Acceleration related illusions
    3. Adverse physiological condition (drug, dehydration, fatigue)

- Loss of Situational Awareness
  - Types:
  1. Geographic disorientation (off navigation route or map, lost)
  2. General loss of SA (did not perceive hazards)
  3. Erroneous situation assessment (misinterpreted situation or condition)
  4. Perceptual tunnelling
  5. Failed to predict or anticipate changing conditions
  6. False hypothesis
  7. Confirmation bias
  8. Workload task/timing

- Attention Failure
  - Types:
  1. Missed flight checklist items, callout or crew challenge
  2. Failed to monitor flight progress or maintain instrument scan
  3. Failed to respond to communications or warning
  4. Control action errors (motor response slip or memory lapse)
     a) Forgot to set/move/reset switch (lapse)
     b) Unintentional activation (slip)
     c) Control substitution (slip)
     d) Control reversal (slip)
     e) Control adjustment/precision error (slip)

Conditions that influence Attention and Situation Awareness

1. Inattention
2. Channelized or task fixated (perceptual narrowing)
3. Distraction (internal, external)
4. Task overload (excess tasking with/without mission performance time pressure)
5. Cognitive workload (problem solving workload or information overload)
6. Habituation (old/previous learned habit interference)
7. Excess stress or fatigue
8. Excess mission tasking or workload
9. Inadequate briefing or poor flight preparation
10. Inadequate training or experience for the mission
11. Negative learning transfer (i.e. new aircraft transition)
12. Adverse weather/meteorological conditions
13. Advers cockpit environmental conditions
14. Tactical situation or display information overload
15. Low aircrew motivation or poor flight vigilance
16. Poor cockpit design (control display location or data format)

# Sensory-Perceptual Risk Management

- Provide continued education for pilots and air safety reps
- Engage FAA AMEs and industry aeromedical organizations
- Establish weather go/nogo decision criteria
- Utilize mission analysis matrix
- Establish SOPs and protocols for known high risk missions (night, weather, fatigue, training)

# Medical and Physiological Factors

- Self Medicated
- Under influence
- Known illness
- Excess personal stress
- Fatigue
- Nutrition
- G-LOC or g excess
- Hypoxia or hyperventilation
- Other

– Conditions that lead to adverse medical/ physiological state

1. Mission fatigue (on duty over 12 hours, late night or early morning 0200-0600
2. Cumulative fatigue (excess physical or mental workload, circadian disruption or sleep loss)
3. Cumulative effects of personal or occupational stress (exceeds personal coping limits)
4. Emergency flight condition/workload transition
5. Medical or physiological preconditions (preceding state of health, fitness level, hangover, dehydration, etc…)

# Medical and Physiological Factor Risk Management

- Document medical and physiological qualifications
- Protect aviators under high stress due to human factors
- Share human factors hazard reports of physiological incidents
- Use aeromedical team resources
- Use CIRP and EAP

# Knowledge or Skill Factors

- Inadequate knowledge of systems, procedures (Knowledge based error)
- Poor flight control, airmanship or poor accuracy of flight maneuvering (Skill based error)
- Misuse of rules or incorrect performance of cockpit task (Rule based error)

  – Types:

  A. Failed to perform required procedure(s)
  B. Used wrong procedure or rule(s)
  C. Missed step(s) in a prescribed sequence
  D. Performed steps out of sequence

- Conditions that lead to poor operational performance

1. Below required proficiency or currency standards
2. Poor performance trend and/or documented flight aptitude deficiencies
3. Low flight hours (total or in type model)
4. Lacked essential training for specific tasks
5. Lacked recent mission or flight conditions (instrument, night, weather, etc)
6. Transition pilot
7. Marginal Aviator (documented history of poor performance or flight violations)

# Knowledge and Skill Factor
# Risk Management

- Establish proficiency and currency standards
- Enforce standards in a just manner
- Assess training program against standards
- Document training results
- Use remedial training
- Remove or protect marginal aviators

# Personality and Safety Attitude

- Pattern of overconfidence
- Pattern of excess motivation
- Anger or job frustration
- Hot dogging
- Assertive or non-assertive
- Lacked confidence to perform task or mission
- Yielded to operational pressure to perform in hazardous situation (from command or peers)

- Contributing factors that lead to poor safety attitude

1. Habitual high risk taker
2. Overconfidence
3. Marginal or high risk aviator
4. Excess motivation (no limits)
5. Poor command climate or safety culture (lack of adequate supervision)

# Personality and Safety Attitude Risk Management

- Identify chronic high-risk takers
- Use judicious crew assignment and scheduling
- Conduct periodic human factors review
- Use Human Factors Board to manage at risk aviators

# Judgment and Risk Decision Factors

- Knowingly accepts high risk situations
- Misjudged actual risk of mission (complacency)
- Did not monitor flight progress/conditions
- Incorrect task priorities
- Knowingly deviated from safe procedure
- Intentionally violated safety standard or regulation
- Knowingly exceeded personal limits
- Knowingly exceeded aircraft limits
- Knowingly exceeded prescribed mission parameters
- Yielded to social pressure

- Conditions that contribute to inappropriate risk judgment

1. Hotdog or high risk aviator
2. Excess motivation
3. Uncontrolled life stress
4. Too assertive or non-assertive interpersonal style
5. Influenced by poor command climate or safety culture (lack of adequate supervision)

# Judgment and Decision Factor Risk Management

- Enforce go/no-go criteria
- Illustrate judgment by example
- Provide crew judgment training and evaluation
- Monitor and correct high risk behavior
- Develop personal SOPs (mins)

# Crew Coordination Factors

- Inadequate mission plan, brief or preflight
- Failed to communicate plan or intentions
- Failed to use standard language
- Misunderstood or unacknowledged communications (readback hearback)
- Inadequate challenge, crosscheck or monitoring
- Withheld vital safety data
- PIC failed to lead and delegate
- PIC failed to use all available resources
- Interpersonal conflict

- Conditions that contribute to poor crew coordination
- Inadequate training in communications and crew coordination
- Inadequate SOP for use of crew resources
- Weak support from command for aircrew coordination doctrine
- Aircrew/cockpit rank and experience gradients
- Command safety culture does not support crew concept

# Crew Coordination Factor
# Risk Management

- Establish CRM protocols and SOPs
- Provide CRM (Team) training
- Construct mission task SOPs (crew tasks)
- Brief and debrief CRM events (ASRS)
- Use specific training to teach and learn CRM tasks and skills

# Design and System Factors

- Used wrong switch, lever or control
- Misread or misinterpreted instrument reading
- Could not reach or see control
- Could not see or read instrument or indicator
- Failed to respond to warning signal or wrong response
- Mode confusion
- Automation complacency or fascination

Conditions that contribute to design-induced errors

1. Poor primary aircraft controls or display arrangement
2. Inadequate primary data display or data format
3. Hard to read instrument data (Text size, font, color, glare, lighting)
4. Incompatible cockpit control display activation or response
5. Inadequate hazard advisory or warning display
6. Poor cockpit design layout (vision, reach)
7. Poor human computer display interface/usability (error-prone design)
8. Poor systems instruction
9. Inadequate aviation systems support or facilities (nav aids, airport, air traffic control)
10. Non-standard cockpit layout
11. Inappropriate type or level of automation, or excess operational mode complexity

# Design and Systems Factors
# Risk Management

- Train and test aircraft systems knowledge
- Fly by the book
- Identify aircraft limits and tolerances
- Identify faulty cockpit layout, control and display designs
- Publish hazard reports and recommend design changes Flight Ops
- Consider Airports, ATC, Manufacturers (Aircraft, Engines, Avionics…), Contractors

# Supervisory Factors

- Inadequate schedule or crew assignment
- Failed to monitor crew rest/duty
- Failed to establish adequate standards
- Failed to monitor compliance to standards
- Failed to monitor crew qualification/training
- Failed to screen/remove high risk aviators
- Failed to establish/monitor quality standards
- Intentionally violated or directed others to vioate  standards, rule or regulation
- Command failed to monitor, perceive and assess actual mission risks, with respect to:
  - Environmental hazards and operating conditions
  - Mission tasking and aircrew skill level
  - Aircrew, and system limitations (Aircraft, maintenance, Airports, ATC, Dispatch, flight ops

- Conditions contributing to supervisory failures

1. Excess ops tempo, organizational workload (imposed by command or system)
2. Poor command safety climate/culture, lax safety supervision
3. Inadequate standards and/or low performance expectations
4. Command did not provide adequate resources to support safe mission accomplishment
5. Command did not adequately train the mishap pilot or crew
6. Commanders did not set a good example, or set a bad example
7. Supervisors did not provide adequate commitment or emphasis on safe operations
8. Command has poor communications up/down command chain
9. Command has no system o weak system for management of high risk aviator
10. Command has weak process for operational risk management
11. Command did not provide adequate aeromedical of human factors training
12. Command did not enforce aeromedical standards

# Supervisory Factor
# Risk Management

- Establish positive command climate
- Set the safety example
- Include safety advocacy as organizational goal
- Set clear performance standards
- Monitor compliance to SOPs
- Know yourself and your team
- Keep an open door and open mind
- Correct poor performance and non-compliance
- Reward safe behavior
- Embed risk management

# Organizational Factors

- Production
- “Risk Management”

# Regulatory Factors

- Production
- Protection
- Probable Cause paradigm

# References


- Human Factors Checklist: An Aircraft Accident Investigation Tool, Appendix B: Crew Resource Management

(Naval Postgraduate School, School of Aviation Safety, Ciavarelli & Sather, 2002)

https://www.netc.navy.mil/nascweb/sas/files/hfchklst.pdf

Thank you for your dedication to the continuous improvement of aerospace safety

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