



HUMAN FACTOR

1. Introduction

The study of human factors is about understanding human behaviour and performance. In aviation operations, human factors knowledge is used to optimize the fit between people and the systems in which they work in order to improve safety and performance.

Human error has been documented as a primary contributor to **more than 70% of commercial airplane hull-loss accidents**. While typically associated with flight operations, human error is also a major concern in aircraft maintenance practices and air traffic management.

The term "human factors" has grown increasingly popular as the commercial aviation industry has realized that human error, rather than mechanical failure, underlies most aviation accidents and incidents. In commercial aviation, human factors are often considered synonymous with crew resource management (CRM).

2. Human Error type

Errors can be broadly distinguished in two categories:

- Category 1 - A person intends to carry out an action, the action is appropriate, carries it out incorrectly, and the desired goal is not achieved. An execution failure has occurred.
- Category 2 - A person intends to carry out an action, does so correctly, the action is inappropriate, and the desired goal is not achieved - A planning failure has occurred. Planning failures are Mistakes.

Execution failure can be split into slips (attention troubles) and lapses (memory troubles):

- Slips can be perceptual confusions, interference errors, reversal, misordering, mistiming
- Lapses can be omissions, repetitions, memory reduced intentionality

Planning failures can be split into rules based mistakes and knowledge based mistakes:

- Rules based mistakes are misapplication of a good rule or, application of a bad rule
- Knowledge based mistakes can be confirmation bias, selectivity, out of sight out of mind, encystment, vagabonding

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3. Interruption and distraction

In the IVAO network, interruptions and distractions are usual threats generated in the operating environment that affects or complicates the performance of a task or a crew's compliance with applicable standards.

Here are the results of a nice study of the effects of distractions and interruptions in approach and landing accidents:

Factor	% of Events
Omission of action or inappropriate action	72%
Inadequate crew coordination, cross-check and backup	63%
Insufficient or loss of lateral or vertical situational awareness	52%
Inadequate or insufficient understanding of prevailing conditions	48%
Slow or delayed action	45%
Incorrect or incomplete pilot/controller communications	33%

An interruption/distraction often leaves the flight crew with a feeling of being rushed and faced with competing tasks of varying priority. This can result in an increase in workload even when the actual task load is reasonable and steady. As a result, a crew faced with concurrent task demands will typically focus on one or a few tasks while ignoring all others. This response is typical of most people when dealing with excessive workload.

The following are examples of unsafe situations resulting from interruptions and distractions:

- Taxiway or runway incursion
- Incorrect aircraft configuration for takeoff
- Late landing gear retraction
- Premature or delayed slats/flaps retraction
- Flaps placard-speed (VFE) exceedance
- Late response to ATC instructions
- Failure to select engine anti-ice when required
- Altitude/flight level "bust" in climb or descent
- Inadequate fuel management or late detection of fuel imbalance
- Speed below minimum during descent
- Failure to reset altimeter
- Altitude deviation or stall during holding pattern
- Late aircraft configuration for landing
- Failure to capture localizer or glide slope
- Descent below MDA
- Taxiway excursion
- Failure to set parking brake on arrival at gate or parking stand.

Some interruptions and distractions are difficult to detect. The first priority must be to recognize that a disruption has occurred. Once you are aware that the normal flow of activities has been interrupted, the second priority is to re-establish situational awareness.

This is accomplished through the following steps:

- Identify yourself - What was I doing?
- Ask yourself - Where was I interrupted?

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- Decide - What decision or action shall I take to get “back on track?”

4. Deviation from standard operating procedures

Pilots sometimes may deviate due to different factors like:

- Task saturation
- Inadequate knowledge or training
- Failure to understand the rule, procedure or action
- Inadequate vigilance (fatigue)
- Interruptions
- Distractions
- Incorrect management of priorities (lack of decision making)
- Reduced attention in abnormal conditions or high-workload conditions
- Personal constraints
- Overconfidence

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5. Example of human factor

5.1. Errors in using automation on aircraft

Errors in using automatic flight systems and insufficient knowledge of these systems are contributing factors in landing accidents and approach incidents.

The following factors are cited when discussing errors using automatic systems are:

- Inadvertent selection of an incorrect mode
- Failure to verify the last action performed on display, or via annunciator (altitude change, heading change, speed change...)
- Failure to arm a mode at the correct time (approach mode)
- Inadvertent change of a target entry
- Failure to enter a required target
- Entering altitude that is lower than the final approach intercept altitude during approach phase
- Failure to monitor automation and cross-check parameters
- Inadequate situational awareness
- Overreliance on automation
- Incorrect interaction with automation due to inadequate knowledge or training

5.2. Crew/ATC communication

The following factors are cited when discussing the problems of understanding in communication:

- High workload
- Fatigue
- Interruption
- Distraction
- Conflict and pressure (stress)
- Failure to listen or to respond

5.3. Non-stabilized approach

The following factors are cited when discussing non-stabilized approaches:

- Fatigue in operation (long haul)
- Pressure of flight schedule
- Insufficient time to plan, prepare and conduct a safe approach
- Inadequate ATC instruction not adapted to crew capability and aircraft capability
- Inadequate awareness of adverse weather conditions
- Incorrect anticipation of aircraft deceleration
- Failure to recognize deviations and failure to react on time to deviations
- Pilot overconfidence
- Visual illusions during the acquisition of visual references

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5.4. Runway overruns

The following factors are cited when discussing runway overruns:

- No go-around decision
- Inaccurate on weather condition (wind, runway condition, wind shear, cross wind)
- Late take over from automation
- Inoperative equipment not noted or reminded needed as minimum equipment required
- Undetected thrust asymmetry (forward or reverse asymmetric)

5.5. Briefing technique

The importance of briefing technique is often underestimated and sometimes ~~not~~ performed by non-~~experimented~~-experienced crew.

Routine and formal repetition of the same information on each flight may create a sensation of counterproductive task, but adapting and expanding the briefing should help the pilot flying to know the sequence of events and actions, and the special hazards of the flight phase concerned.

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