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JOURNAL AND OTHER ARTICLES

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UNDERSTANDING HUMAN FACTORS THROUGH HUMAN FACTOR ANALYSIS AND CLASSIFICATION SYSTEM (HFACS) CAUSING AVIATION INCIDENTS / ACCIDENTS

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ABSTRACT

In an era where a large portion of aviation incidents / accidents attributed to human error, it is critical to understand why people did what they did, rather than judging them for not doing what we now know they should have done. The prevailing means of understanding / investigating human error in aviation incidents / accidents remains the analysis of aviation incident / accident data. Unfortunately, most aviation incidents / accidents reporting systems are not designed around any theoretical frame work of human error. The Human Factor Analysis and Classification System (HFACS) is a general human error framework originally developed and tested within the U.S. military as a tool for investigating and analyzing the human causes of aviation incidents / accidents. Based upon Reason's (1990) model of latent and active failures, HFACS addresses human error at all levels of the system, including the condition of aircrew and organizational factors.

KEYWORDS

Human Error, Aviation, Incidents, Accidents, Causes.

INTRODUCTION

Nobody is perfect in this world. To err is human. If people stop committing mistakes (mistakes committed unknowingly) they will become GOD. People say even GOD commits mistakes, and our religious scriptures are testimony to this. Mistakes are inevitable part of human life, therefore it should come as no surprise that human error has been implicated in a variety of occupational accidents, including 70% to 80% of those in civil and military aviation (Yacavone, 1993; Batt, Wiggins, Morrison & O'Hare, 1994; Wiegmann & Shappell, 1999).

According to many aviation safety experts, the aircraft incidents and accidents almost always result from a series of events, each of which is associated with one or more cause factors. "Causes" are actions, omissions, events, conditions or a combination thereof, that lead to an accident or incident. "Accidents" are occurrences associated with the operation of aircraft, from the time person boards an aircraft with the intention of flight until the time all persons have disembarked, that results in either the aircraft sustaining damage/ structural failure that adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component or the aircraft is missing/ completely inaccessible, or a person is fatally/seriously injured. Whereas "Incidents" are occurrences, other than accidents associated with the operation of aircraft that affect or could affect the safety of operation.

The definition of cause given above takes into account the many events involved in an accident or incident. These events can be viewed as links in a chain. Subdividing an incident or accident into a chain of events reveals important information. If one more element is added to the chain in an incident, for example the consequences of the incident might be much more serious, even resulting in accident. Conversely, removing one link in the accident chain could substantially mitigate the consequences or possibly prevent all adverse consequences. In other words from a safety management viewpoint the only meaningful difference between many incidents and accidents are the consequences.

Analyses of the chain of events in accidents are generally useful just for preventing similar accidents. A proactive approach that could eliminate risks before they cause accidents requires an effective means of tracking the chains of events in both incidents and accidents. Preventive action (not just remedial action) could be taken - based on how often individual links in the chain recur and their potential for contributing to future incidents and accidents. Every abnormal event in the incident or accident chain could be examined to identify the cause factors that explain why it happened and to describe the underlying problems and deficiencies that should be corrected. The different cause factors can be grouped into the following categories:

- Human factor / Personnel error
- Malfunction or failure of aircraft structures, engines or other systems
- Deficient maintenance
- Hazardous environment involving weather, volcanic ash, birds etc.
- Air Traffic management errors
- Any combination of the above.

In fact, while the number of aviation accidents attributable solely to mechanical failure has decreased markedly over the past forty years, those attributable, at least in part to human error, have declined at a much slower rate (Wiegmann & Shappell, 1996). Given such findings, it would appear that interventions aimed at reducing the occurrence or consequences of human error have not been as effective as those directed at mechanical failures. Clearly, if accidents are to be reduced further, more emphasis must be placed on the genesis of human error as it relates to accident causation.

HUMAN FACTOR / PERSONNEL ERROR

In human factors today there are basically two different views on human error and the human contribution to aviation incidents / accidents. The "Old View" (Reason, 2000) sees human error as a cause of failure. As per the old view of human error:-

- 1) Human error is the cause of most aviation accidents / incidents.
- 2) The engineered systems in which people work are made to be basically safe; their success is intrinsic. The chief threat to safety comes from the inherent unreliability of people.
- 3) Progress on safety can be made by protecting these systems from unreliable humans through selection, proceduralization, automation, training and discipline.

"The New View", sees human error not as a cause, but as a symptom of failure (Rasmussen & Batstone, 1989; Woods et al., 1994; Hoffman & Woods, 2000; Reason, 2000). According to "The New View" of human error:-

- Human error is a symptom of trouble deeper inside the system.
- Safety is not inherent in system. The systems themselves are contradictions between multiple goals that people must pursue simultaneously. People have to create safety.
- Human error is systematically connected to features of people's tools, tasks and operating environment. Progress on safety comes from understanding and influencing these connections.

The new view of human error represents a substantial movement across the fields of human factors and organizational safety (Reason, 1997; Rochlin, 1999) and encourages the investigation of factors that easily disappear behind the label "human error"- longstanding organizational deficiencies; design problems; procedural shortcomings and so forth. The rationale is that human error is not an explanation for failure, but instead demands an explanation, and that effective

countermeasures start not with individual human beings who themselves were at the receiving end of much latent trouble (Reason, 1997) but rather with the error-producing conditions present in their working environment. Most of those involved in accident research and analyses are proponents of the new view.

"...simply writing off... accidents merely to (human) error is an overly simplistic, if not naïve, approach... After all, it is well established that accidents cannot be attributed to a single cause, or in most instances, even a single individual." (Shappell & Wiegmann, 2001, p.60).

Our willingness to embrace the new view of human error in our analytic practice is not always matched by our ability to do so. When confronted by failure, it is easy to retreat into the old view. We seek out the "bad apples" and assume that with them gone, the system will be safer than before. An investigation's emphasis on proximal causes ensures that the mishap remains the result of a few uncharacteristically ill-performing individuals who are not representative of the system or the larger practitioner population in it. It leaves existing beliefs about the basic safety of the system intact.

HUMAN FACTOR ANALYSIS AND CLASSIFICATION SYSTEM (HFACS)

Aviation incidents / accidents do not happen in isolation. Rather they are the result of a chain of events often culminating with the unsafe acts of aircrew. Heinrich's "axioms of industrial safety" (Heinrich, Peterson & Roos, 1931), Bird's (1974) "Domino Theory" and Reason's (1990) "Swiss Chees" model of human error, a sequential theory of accident causation has been consistently embraced by most in the field of human error. Particularly useful in this regard has been Reason's (1990) description of active and latent failures within the context of his "Swiss Chees" model of human error.

Reason believes that accidents result from combinations that are not always predictable, from human and organizational factors within a complex system. His organizational accident model explains these events with the occurrence of failures or absent defenses and safeguards in the system developed to minimize the chances of accidents. Active failures occur near the accident outcome involving the behaviour (decisions, actions or omissions) of operators and are difficult to predict and control. These active failures originate in latent conditions related to technical and organizational factors present in the system well before accidents occur. Reason's model also includes a demonstration of the possibility of accidents occurring without active failures i.e. triggered directly from interactions between latent conditions. Therefore, if a comprehensive analysis of human error is to be conducted, a taxonomy that takes into account the multiple causes of human failure must be offered. Based on Reason's model, Shappell & Wiegmann, (1997, 2000) developed a comprehensive human error framework – the Human Factor Analysis and Classification System (HFACS), to meet these needs (Figure 1).

HFACS based on Reason's (1990) model of latent and active failures, was originally developed for the U.S. Navy and Marine Corps as an accident investigation and data analysis tool. It has been also employed by other military organizations like U.S. Army, Air force, and Canadian Defense Force as an adjunct to preexisting accident investigation and analysis system.

HFACS describes human error at each of four levels of failure:-

- Unsafe acts of Operators (e.g. aircrew),
- Preconditions for unsafe acts,
- Unsafe supervision and
- Organizational influences.

A brief description of each causal category is as follows:-

1. UNSAFE ACTS OF OPERATORS

The unsafe acts of operators (aircrew) can be loosely classified into one of two categories: errors & violations (Reason, 1990). While both are common within most settings, they differ markedly when the rules and regulations of an organization are considered. That is, errors can be described as those "legal" activities that fail to achieve their intended outcome, while violations are commonly defined as behaviour that represents the willful disregard for the rules and regulations. It is within these two overarching categories that HFACS describes three types of errors (decision, skill-based and perceptual) and two types of violations (routine and exceptional).

I. Errors

a) Decision Errors

It represents conscious, goal-intended behavior that proceeds as designed; yet, the plan proves inadequate or inappropriate for the situation. Often referred to as "honest mistake", these unsafe acts typically manifest as poorly executed procedures, improper choices, or simply the misinterpretation or misuse of relevant information.

b) Skill-Based Errors

They occur with little or no conscious thought. Just as little thought goes into turning one's steering wheel or shifting gears in an automobile, basic flight skill such as stick and rudder movements and visual scanning often occur without thinking. The difficulty with these highly practiced and seemingly automatic behaviours is that they are particularly susceptible to attention and/or memory failures. As a result, skill-based errors such as the breakdown in visual scan patterns, inadvertent activation / deactivation of switches, forgotten intentions, and omitted items in checklists often appear. Even the manner (or skill) with which one flies an aircraft (aggressive, tentative or controlled) can affect safety.

c) Perceptual Errors

Perceptual Errors occur when sensory input is degraded, or "unusual", as is often the case when flying at night, in the weather, or in other visually impoverished environments. Faced with acting on imperfect or less information, aircrew run the risk of misjudging distances, altitude and decent rates, as well as a responding incorrectly to a variety of visual / vestibular illusions.

II. Violations

There are many ways to distinguish among types of violations; two distinct forms have been identified based on their etiology.

a) Routine Violations

Routine violations tend to be habitual by nature and are often enabled by a system of supervision and management that tolerates such departures from the rules (Reason, 1990). Often referred to as "bending the rules"; the classic example is that of the individual who drives his automobile consistently 5-10 kmph faster than allowed by law. While clearly against the law, the behaviour is, in effect, sanctioned by traffic police who often will not enforce the law until speeds in excess of 10 kmph over the post limit are observed.

b) Exceptional Violation

Exceptional Violation on the other hand, is isolated departures from authority, neither typical of the individual nor condoned by management. For example, while driving 65 in a 55 kmph zone might be condoned by traffic police, driving 105 kmph in a 55 kmph zone certainly would not. It is important to note, that while most exceptional violations are appalling, they are not considered "exceptional" because of their extreme nature. Rather, they are regarded as exceptional because they are neither typical of the individual nor condoned by authority.

2. PRECONDITIONS FOR UNSAFE ACTS

Simply focusing on unsafe acts, however, is like focusing on a patient's symptoms without understanding the underlying disease state that caused it. As such, investigators must dig deeper into the preconditions for unsafe acts. Within HFACS, two major subdivisions are described: substandard conditions of operators and the substandard practices they commit.

I. Substandard Conditions of Operators

a) Adverse Mental States

Being prepared mentally is critically in nearly every endeavour; perhaps it is even more so in aviation. With this in mind, the first of three categories, adverse mental states, was created to account for those mental conditions that adversely affect performance. Principal among these are the loss of situational awareness, mental fatigue, circadian dysrhythmia, and pernicious attitudes such as overconfidence, complacency and misplaced motivation that negatively impact decisions and contributions to unsafe acts.

b) Adverse Physiological States

Adverse Physiological States are those that preclude the safe conduct of flight. Particularly important to aviation are conditions such as spatial disorientation, visual illusions, hypoxia, illness, intoxication and a whole host of pharmacological and medical abnormalities known to affect performance. For example, it is not surprising that, when aircrews become spatially disoriented and fail to rely on flight instrumentation, accidents can, and often do occur.

c) Physical and /or mental limitations

Physical and /or mental limitations of the operator, the third and final category of substandard condition, includes those instances when necessary sensory information is either unavailable or if available individuals simply do not have the aptitude skill or time to safely deal with it. For aviation, the former often includes not seeing other aircraft or obstacles due to the size and or contrast of the object in the visual field. However, there are many times when a situation requires such rapid mental processing or reaction time that the time allotted to remedy the problem exceeds human limits (as is often the case during nap-of-the-earth flight). Nevertheless, even when favourable visual cues or an abundance of time is available, there are instances when an individual simply may not possess the necessary aptitude, physical ability, or proficiency to operate safely.

II. Substandard Practices of Operators

Often times, the substandard practices of aircrew will lead to the conditions and unsafe acts described above. For instance, the failure to ensure that all members of the crew are acting in a coordinated manner can lead to confusion (adverse mental state) and poor decisions in the cockpit.

a) Crew Resource Mismanagement

Crew Resource Mismanagement includes the failures of both inter and intra cockpit communication as well as communication with ATC and other ground personnel. This category also includes those instances when crewmembers do not work together as a team or when individuals directly responsible for the conduct of operations fail to coordinate activities before, during and after a flight.

b) Personal Readiness

Individuals must ensure that they are adequately prepared for flight. Consequently, the category of personal readiness was created to account for those instances when rules such as disregarding crew rest requirements, violating alcohol restrictions, or self-medicating are not adhered to. However, even behaviours that do not necessarily violate existing rules or regulations (e.g. running ten miles before piloting an aircraft or not observing good dietary practices) may reduce the operating capabilities of the individual.

3. UNSAFE SUPERVISION

Aircrews are responsible for their actions and as such must be held accountable. However, in many instances they are the unwitting inheritors of latent failures attributable to those who supervise them (Reason, 1990). To account for these latent failures, the overarching category of unsafe supervision was created within which four categories (inadequate supervision, planned inappropriate operations, failed to correct known problems and supervisory violations) are included.

a) Inadequate Supervision

It refers to failures within the supervisory chain of command, which was a direct result of some supervisory action or inaction. That is, at a minimum, supervisors must provide the opportunity for individuals to succeed. It is expected that individuals will receive adequate training, professional guidance, oversight and operational leadership and that all will be managed appropriately. When this is not the case, aircrews are often isolated as the risk associated with day to day operations invariably will increase.

b) Planned Inappropriate Operations

The risk associated with supervisory failures can come in many forms. Occasionally, for example, the operational tempo and / or schedule are planned such that individuals are put at unacceptable risk and ultimately, performance is adversely affected. As such the category of Planned Inappropriate Operations was created to account for all aspects of improper or inappropriate crew scheduling and operational planning which may focus on such issues as crew pairing, crew rest and managing the risk associated with specific flights.

c) Failed To Correct Known Problems

It refers to those instances when deficiencies among individuals, equipment, training or other related safety areas are "known" to the supervisor, yet are allowed to continue uncorrected. For example, the failure to consistently correct or discipline inappropriate behavior certainly foster an unsafe atmosphere but is not considered a violation if no specific rules or regulations were broken.

d) Supervisory Violations

Supervisory Violations are those instances when existing rules and regulations are willfully disregarded by supervisors when managing assets. For instances, permitting aircrew to operate an aircraft without current qualifications or license is a flagrant violation that invariably sets the stage for the tragic sequence of events that predictably follow.

4. ORGANIZATIONAL INFLUENCES

Decisions of upper level management can directly affect supervisory practices as well as the conditions and actions of operators. Unfortunately, these organizational influences often go unnoticed or unreported by even the best intentioned accident investigators. These latent organizational failures generally revolve around three issues viz. resource management, organizational climate and operational processes.

a) Resource Management

Resource Management refers to the management, allocation and maintenance of organizational resources including human resource management (selection, training, staffing), monetary safety budgets and equipment design (ergonomic specification). In general corporate decisions about how such resources should be managed center around two distinct objectives – the goal of safety and the goal of on-time, cost effective operations. In time of prosperity both objectives can be easily balanced and satisfied in full. However, there may also be times of fiscal austerity that demand some give and take between the two. Unfortunately, history tells us that safety is often the loser in such battles, as safety and training are often the first to be cut in organizations experiencing financial difficulties.

b) Organizational Climate

It refers to a broad class of organizational variables that influence worker performance and is defined as the "situational based consistencies in the organization's treatment of individuals" (Jones, 1988). One telltale sign of an organization's climate is its structure as reflected in the chain of command, delegation of authority and responsibility, communication channels and formal accountability for actions. Just like in the cockpit, communication and coordination are vital within an organization. However, an organization's policies and culture are also good indicators of its climate. Consequently, when policies are ill defined, adversarial or conflicting or when they are supplanted by unofficial rules and values confusion abounds and safety suffers within an organization.

c) Operational Processes

It refers to formal processes (operational tempo, time pressures, production quotas, incentive systems, schedules etc.), procedures (performance standards, objectives, documentation, instructions about procedure etc.) and oversight within the organization (organizational self study, risk management and the establishment and use of safety programs). Poor upper level management and decisions concerning each of these organizational factors can also have a negative, indirect effect on operator performance and system safety.

CONCLUSION AND RECOMMENDATIONS

Robert Cohn a pilot & the author of the book "They called it Pilot Error" say "In retrospect, I was shortchanged. When I thought more about it I realized that I had never been taught or even made aware of many of the things that are crucial to the safe and proper use of an airplane. I had to learn those the hard way". He never had any training on most physiological, mental and purely human factors that can seriously detract from or mental contribute to safe flying.

In order to reduce Human Error, a major step would be to develop design specifications that consider the functionality of the human with the same degree of care that has been given to the rest of the system (Norman, 1990).

Human error and their negative consequences can be decreased in one of the three ways (Wickens et al, 1998):-

- 1) System Design
- 2) Training
- 3) Personnel Selection

System design can reduce errors by making it impossible for a person to commit an error making it difficult to commit an error or making the system error tolerant so that when error occur the negative consequences are avoided. Error tolerance can be achieved by methods such as feedback to the operator about current consequences, feedback about future consequences and monitoring actions for possible errors. Design features can be included so that erroneous actions can be reversed if they are noticed before they have serious consequences on system performance. Human factors principles should be applied to design. The goal is to reduce if not eliminate risk through design. An important thing to remember is that reliability goes down as complexity goes up.

When system design cannot be used then selection and training methods should be used to minimize operator error. Training & Personnel selection are important factors, however as mistakes are unavoidable in human performance even the most experienced and best trained pilots will make errors. To solve this problem a new field of management named **"error management"** has developed in the past two decades. While we must accept the inevitability of error, we must nevertheless maintain performance standards. Error management demands that we distinguish between an individual being reckless or showing a disregard for the rules and mistakes that are simply the product of human limitations (Ragman, 1999). "Error Management" represents a fundamental shift in aviation philosophy from "excellent airmen commit no error" to "excellent airmen commit, recognize and resolve errors".

Human error is universal and inevitable. Error does not, has not & will not cause an incident or an accident. These are the two important premise of error management. Consequences cause an incident or an accident. While error is universal and inevitable Consequences are not universal or inevitable. The logic of this premise is beyond dispute. Errors happen all the time. Incidents / accidents do not. Error Management targets the gap between the errors and their consequences. Error management holds the view that any attempt to address flight safety, which does not acknowledge universal and inevitable human error will fall short of the mark. The acknowledgement removes the stigma associated with error. It depersonalizes error. Error is no longer a reflection upon the crew member. Just as the sun will rise in the east and set in the west, errors will occur. Error management also assumes technical proficiency. Technically proficient crewmembers commit errors. Incompetent crew members should not be flying airplanes.

The HFACS framework bridges the gap between theory and practice by providing safety professionals with a theoretically based tool for identifying and classifying the human causes of aviation incidents / accidents. Because the system focuses on both latent and active failures and their interrelationships, it facilitates the identification of the underlying causes of human error. To date, HFACS has been shown to be useful within the context of military aviation as both a data analysis framework and an accident investigation tool.

REFERENCES

1. Bird, F. (1974). Management guide to loss control. Atlanta, GA: Institute Press.
2. Fleiss, J. (1981). Statistical Methods for Rates and Proportions. New York: John Wiley.
3. Ford, C., Jack, T., Crisp, V. & Sandusky, R. (1999). Aviation accident causal analysis. Advances in Aviation Safety Conference Proceedings, (P-343). Warrendale, PA: Society of Automotive Engineers Inc.
4. Geller, E. (March, 2000). Behavioral safety analysis: A necessary precursor to corrective action. Professional Safety, 29-32.
5. International Civil Aviation Organization (1993). Investigation of human factors in accidents and incidents (Human Factors Digest #7), Montreal:Canada.
6. Jones, A. (1988). Climate and measurement of consensus: A discussion of "organizational climate." In S. Cole, R. Demaree & W. Curtis, (Eds.), Applications of Interactionist Psychology: Essays in Honor of Saul B. Sells (pp. 283-290). Hillsdale, NJ: Earlbaum.
7. National Transportation Safety Board (2000). Aviation accident statistics. [On-line]. Available: www.ntsb.gov/aviation/Stats.htm
8. O'Hare, D. (in press). The Wheel of Misfortune. Ergonomics.
9. O'Hare, D., Wiggins, M., Batt, R., and Morrison, D. (1994). Cognitive failure analysis for aircraft accident investigation. Ergonomics, 37, 1855-69.

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