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Importance of Exploring Human Errors in Practical Field

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Abstract:

The main objective of exploring human error is to reduce adverse events in human life. Error is obvious in mortal life and same as it is the root cause of all sufferings. And so, we all unconditionally try to avoid mistakes. But the paradox is we cannot go beyond error. In this situation, the best option is maybe to be more conscious about the field where the error is most vulnerable and causes profound effects like death. In this context most relevant field is aviation. There, a tiny mistake causes the end of life of lots. This discussion analyzes human errors in the aviation sector in three steps: firstly, it explores different types of errors that occur in operational procedures; secondly, it highlights the essential cognitive factors behind them. Finally, it suggests some approaches to reducing human error in the practical field based on the analysis.

Study Method: Reference method was used for the present article.

Data Collection: Data was collected through books, journals, websites etc.

Key words: *human error, aviation error, utility of error safety culture, active error, latent error.*

Introduction:

Human error is a large subject and has been studied in heterogeneous disciplines. In philosophy, errors are discussed epistemologically, and psychologists concentrate on their influence on human behavior. For cognitive theorists, error provides essential clues to the underlying factors of human action. According to applied practitioners, they remain the main threat to the safe operation of high-risk technologies. And in this article, we highlight the last one. Theoretical conceptions of error are not enough to understand error. We need to be concerned about human error in the context of practical field. In practical field human error is mainly referred as a factor in occurrence of severe adverse event. There are many underlying factors behind a successful action. It is also true that any system is operated by human being, so for any type of failure human beings will be ultimately responsible. Practically we blame agent on the ground that we believe only he/she is capable to correct an action before it results to an adverse event.

Aim and objective:

1. Any human error investigation aims to prevent adverse events, so it is vital to highlight some human errors that occur in the practical field and cause various unpleasant events.
2. This article highlights errors in sectors of aviation. In this domain, human errors frequently result in severe adverse incidents, mainly death. So if we find the cognitive factors behind these errors may help them in finding a remedy to reduce them.
3. Analyzing these errors, we can find that the general features of human errors are also shown in the practical field.
4. In *a safety culture*, human errors in the practical field are treated very sensitively. In this context, analyzing some mistakes in a specific area may help to find measures to handle them.

An Aviation Accident and Finding Human Error behind them:

The aviation sector is not very familiar to ordinary people, so to understand human errors in this domain, this article briefly describes some aviation accidents and highlights the error behind them. An analyzing of this accident has followed some published accident reports on this fact.

Aviation accident due to mid-air collision between Saudi Arabian airlines Boeing 747-168B and Kazakhstan airlines Ilyushin Il-76.

A Mid-air collision is an aviation accident in which two or more aircraft come into contact during flight. On 12th November 1996 the village of Charkhi Dadri, near west New Delhi, India, an accident occurred between Saudi Arabian airlines Boeing 747-168B and Kazakhstan airlines Ilyushin Il-76. On that very day, the Saudi Arabian Airlines *Boeing 747-168B* was scheduled for the international Delhi–Dhahran–Jeddah passenger service as flight *763 (SVA763)*. On the other hand, the Kazakhstan Airlines Ilyushin Il-76TD was on a charter service from Chimkent to Delhi as *KZA1907*. Air Kazakhstan flight *KZA1907* departed Kazakhastan for Delhi at the scheduled time. As per aviation protocol, while the aircraft was descending on airway G452, the crew contacted the Delhi Airport to give their status report and ask for clearance. Delhi Airport permitted *KZA1907* to fall to 15,000 feet (4,600 m). Then *KZA1907* was 74 nautical miles (137 km) from the beacon of the destination airport, Delhi.
At the same time, on the same airway as *KZA1907*, the Saudi Airways flight *SVA763* was travelling. It was cleared to climb to 14,000 feet (4,300 m). There was no contradictory decision; because *SVA763* was flying in the opposite direction of *KZA1907*. About eight minutes later, around 18:40, *KZA1907* reported reaching its assigned altitude of 15,000 feet (4,600 m), but in reality, it was lower, at 14,500 feet (4,400 m), and still descending. So the controller advised the flight to identify the traffic receiving. But the aircraft did not reply. The controller called *KZA1907* again, but there was no reply again. Then he warned the other flight to keep his distance, but it was too late. The two aircrafts collided, and the tail of *KZA1907* cut through *SVA763*'s left wing and horizontal stabilizer. The disabled Boeing quickly lost control and went into a rapidly descending spiral toward the ground, with fire trailing from the branch. The Boeing broke up in the air under stress before the wreckage hit the ground at almost 1,135 km/h (705 mph). As a result of this accident, all aircraft passengers died.

We may identify some human errors as probable causes behind this accident as active and latent errors. Active error is the immediate cause behind an accident, and latent errors are the remote cause behind an accident.

Active error behind this accident:

The root and approximate cause of the collision was the unauthorized descending by the pilots of Kazak aircraft. The commission determined that the accident had been the fault of the *KZA1907*commander. According to *Flight Data Recorder* (FDR) evidence, he had descended from the assigned altitude of 15,000 to 14,500 feet (4,600 to 4,400 m) and subsequently 14,000 feet (4,300 m) and even lower.

Latent error behind this accident:

According to the reports, it may be ascribed that some important contributory factors behind this accident were:

• Lack of English language skills on the part of the Kazakh aircraft pilot.

• The radio operator did not have his flight instrumentation.

• Radio operator of *KZA1907*failed to identify the actual altitude of the flight, and as a result, he provided the wrong information to the pilot.

• Indian air controllers also complained that the Kazakh pilots sometimes confused their calculations because they were accustomed to using *meter altitudes and kilometre distances. In contrast, most other countries use nautical miles and feet.*

• Furthermore, the Indira Gandhi International Airport did not have secondary surveillance radar. It would help provide extra information, like aircraft's identity and altitude, by reading transponder signals; instead, the airport had primary radar, which produces readings of distance and bearing, but not altitude.

Some Typical Cognitive Errors behind Aviation Accidents

After discussing error reports of these accidents, it may say that human error is the sharp end of aviation accidents. But that is not the only cause of that accident. There are many remote causes responsible for that accident. Apart from technical error, this article highlights the psychologiacal factors behind aviation error. Thus it highlights the cognitive error and psychological factors behind them. We may categorise cognitive error according to their psychological factors as followings:

1. Error due to non-availability of the data
2. Error due to lack of comprehension of the current situation
3. Error in the projection of future status.

i)Error due to non-availability of the data

For the first step in flying operation, the pilot must have sufficient information on relevant environmental elements' status, attributes, and dynamics. The pilot needs to accurately perceive information about his/her aircraft and its systems (airspeed, position, altitude, route, the direction of flight, etc.), weather, air traffic control (ATC) clearances, emergency information, and other pertinent elements. If any of this information is unavailable to him, it may result in an adverse event. This type of error takes place where -

- Data is not available,
- Data hard to discriminate or detect,
- Failure to monitor or observe data,
- Misperception of data or
- Due to the responsible person's memory loss.

ii) Error due to lack of comprehension of the current situation

Understanding the actual situation is necessary for any system operation. If the operator does not comprehend the information, it may cause an error. Comprehension of the situation is based on a synthesis process of the received information. In this stage, the operator becomes aware of the elements he or she has already received and then he/she tries to understand the significance of this information; finally, he/she uses these to achieve the goals. So knowledge of the current situation is essential to take proper decisions. However, comprehension of the receiving data and its significance is also vital. In

modern times a novice operator may be more efficient in gathering information than an experienced one by using a new gadget. However, he needs more experience to use it properly in a critical situation. Not only in the aviation sector, but this also holds good for any other sector. Some factors behind this type of error are mentioned below:

- **A poor mental model** means an operator with a lack of decision-making skills.
- **Use of incorrect mental model:** When received information is misapprehended, it is called the use of the incorrect mental model.
- **Over-reliance on default values**: Sometimes operator keeps all his faith in the collected data without analyzing them. However, then he may collect incorrect data.

iii)Error in the projection of the knowledge for the future status

The ability to take appropriate future actions against the current environment is critical in aviation. If the pilot fails to do so, it will be called an error in the projection of knowledge in the future situation. Some contributory factors behind this type of error:

- **Improper projection of that state:** for a successful presentation, this information must be used ideally for the exact situation.
- **Over-projection of current trends:** Liable agents must update their knowledge every time. Without this quality, he may make mistakes at any time.

Some Approaches for Reducing Human Error in the Aviation Sector

Analyzing different causes behind aviation error, it is very much clear that there are unknown contributory factors to aviation error. Here we include some of them and find measures to handle them:

i)Improving communication among crews

Some steps to improve communication between crews are:

• It must be signed off by the technician doing the work as it is performed. In a continuing process, a shift should be changed after a face-to-face meeting of technicians.

• The applicable paperwork should be reviewed, the completed work discussed, and attention to the next step should be drawn. The absence of written or oral turnover is a warning for a system.

• Work should always be done under the approved written procedure, and all performed steps should bear the signature of the technician who accomplishes the work.

ii)Recovering lack of knowledge

Technology always differs from aircraft to aircraft. So updating technology and procedures on a single aircraft is very necessary for operating an aircraft properly. Lack of knowledge about relevant aircraft may cause great danger to the flight. To reduce errors due to insufficient knowledge of the crew following precautions may be adopted:

• Technicians must be able to use the latest relevant data. For proper knowledge, the technician must consult with the experienced one. If one is not available, or the consulted technician is not familiar with the procedure, a manufacturer's technical representative should be contacted.

• They must also be aware that different aircraft design and maintenance procedures vary. So technicians need to go through training on different types of aircraft.

iii)Avoiding any distraction

If the crew is distracted from any running flight procedure, it may cause a severe accident; to avoid these problems, technicians should follow the following steps:

• Use of a detailed step-by-step procedure and signing off each step only after it is completed also helps.

• Incomplete work can be marked or tagged, especially when the technician is pulled from work by a distraction, and it is unknown when work will be resumed and by whom.

iv)Take precautions about becoming fatigued of the aircrew

Fatigue is a major human factor contributing to many aviation errors resulting in severe accidents. In preventing fatigue, the following steps may be helpful:

• The primary cause of fatigue is a lack of sleep. Sleep and exercise daily. Eight to nine hours of daily sleep are recommended to avoid fatigue.

• Fatigue can also be caused by stress and overworking, so it is necessary to ensure that the agent does not get stressed.

• Working alone when fatigued is particularly dangerous. Constant monitoring by some means is essential.

• Usually, aviation maintenance technicians are performed at night. Therefore, shift work is required to maintain the fleet. Each technician must monitor and control his or her sleep habits to avoid fatigue.

V)Recovering lack of resources

A lack of resources can interfere with one's ability to complete a task because there is a lack of supply and support. Low-quality products also affect one's ability to complete a task. Aviation maintenance demands proper tools and parts to maintain a fleet of aircraft. Any lack of resources to safely carry out a maintenance task can cause both non-fatal and fatal accidents. Some approaches to recovering lack of resources are:

• Within an organization, making sure that the concerned person has the correct tools for the job is as important as having the proper parts when they are needed

• Technical documentation is another critical resource that can lead to problems in aviation maintenance. Resources, such as publication departments and manufacturer's technical support, are available and should be used rather than ignoring the problem.

• Organizations should encourage open communication between the flight and maintenance crews. The flight crew can provide valuable information when dealing with a defective part or problem.

Conclusion:

Finally, following Whittingham (2004), we may say, "A human error is an unintended failure of a purposeful action, either singly or as part of a planned sequence of actions, to achieve an intended outcome within set limits of tolerability pertaining to either the action or the outcome." [1]So, human error is a ubiquitous and essential factor of system error. Human error causes severe types of accidents. But human error is not the only cause behind those accidents. Controlling human errors can reduce the adversity of accidents in different domains. For that, we need to collect vast information about the incident. We have to find underlying factors behind every adverse event, and that will be possible only when we will analyze the error. So not blame the operator of the sharp end but find the controllable factors behind the error. And taking some appropriate initiatives like following established protocol, increasing the responsibility of the relevant operators and organization authority and improving the communication process of the operative team, it is possible to handle the human error and upgrade safety issues in any systematic working zone.

[1] Whittingham, R. B. (2004). *The Blame Machine Why Human Error Causes Accidents*, Burlington, Elsevier, p. 6.

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