

Inclusion of Human Factor Perspective towards Ensuring Quality in Accident Investigation Reports: A Case Study Approach in South Asia

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Abstract

Purpose: Human Factors (HFs) along with systemic factors are found to be the primary cause for accidents as per the investigation reports from across the world. However, these aspects have not been accorded due attention and importance in the investigation reports from developing countries. Providing due consideration to the possibility of multiple factors with specific focus on HFs would provide a robust framework for any investigation and improve its reliability and, hence, ensure quality.

Design/methodology/approach: The paper involves the use of case study method comprising in-depth study and analysis of investigations from multiple countries in the region. This research would help to examine the importance of human factors and inclusion of systemic factors during investigation in South Asia.

Findings: The findings would provide valuable insights for identification of appropriate intervention strategies and would guide policy formulation. This would be a significant contribution to the enhancement of the safety of Aviation in the region which is often faced with the paradox of missing the simple and intuitive universally understood concepts.

Originality/value: Most investigation reports from the countries in South Asian region reflect lack of adherence to the recommended structure of investigation reports as prescribed by world bodies. Accident reports need to give due consideration to the different systemic and human errors so as to recognize the root-cause of these inter-linked errors. This study aims to review the treatment of all these applicable factors in the investigations undertaken in the South Asian Region to assess the practical reality and provide recommendations for improvement.

Keywords: Human factors, Quality management, Aviation, Accident investigation, South-Asia

Category: Conceptual paper

1. Introduction

Accident investigation reports provide valuable insights to improving quality and contributing to safety in any industry. The importance, however, is amplified in aviation given the critical nature of its operations.

Historically, technical factors have dominated the aviation safety system and accident causation factors. Since last few decades, however, the focus has shifted to Human Factors (HF) since they have been identified as the prime cause of majority of air accidents (Burban, 2016). Human Factor has always been a major issue in Aviation safety. Each stakeholder is required to minimize the effects of HF in their area of operation. The importance of HF in Accident Investigation has already been recognized and recommended by the International Civil Aviation organization (ICAO), and many member states have incorporated the recommendations, though not all.

According to the safety report published by the ICAO in 2020, only 46% of the member states have achieved 75% of effective implementation of the safety program. Out of a total of eight areas recommended by ICAO for safety audit, one of them is Accident Investigation. Furthermore, the compliance with requirements for accident investigation as given by ICAO is only 57.3% (Safety Report, 2020)

Developing countries account for majority of the gap in compliance (ICAO, Safety Report , 2020). To address this issue, the present study attempts to review the quality of accident-incident investigations, with specific focus on the inclusion of the human factor (HF) perspective in the aviation industry in South Asia. The study aims to assess the compliance of ICAO Annex 13 and the suggested best practices on accident investigation by the member states in South Asia and thereby reflect on the relevance and importance of inclusion of HF. The findings would provide, the aviation industry and the member states, valuable analytical insight into development of quality investigation report and intervention strategies.

2. Review of Literature

This literature review aims to identify the framework of accident investigation as recommended by ICAO, the central and regulatory authority for civil aviation, and other investigating agencies. This would help establish a standard in accident investigation and report development. In the latter part, the available studies in the related domain are reviewed to help surface the existing scenario in accident investigation worldwide.

According to ICAO Annex 13, the sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents (ICAO Annex 13, 1951). An accident or incident in aviation provides evidence of risks or absence of risk management within the aviation system. A quality (well-conducted) investigation should identify all threats and errors or contributing factors of the accident/incident. The focus of an investigation should be on determining why the accident or incident happened and on recommending appropriate safety measures. A quality (properly conducted) accident investigation is an important method of accident prevention (International Civil Aviation Organisation, 2015) (ICAO DOC. 9756).

Quality system in aviation industry includes the set of policies, procedures and processes required for safe aircraft operation. This includes various internal and external approaches to enhance overall safety (Skybrary, 2020). To enhance overall aviation safety implementation, a robust safety management system is required. This in turn is achieved by combining various safety strategies. Reactive, proactive, and predictive safety strategies are combined to form safety management systems to improve overall safety.

In the quality management system, reactive safety strategies should be emphasized more than the proactive ones, according to Doc 9859 (ICAO, 2017) . The meaning of reactive safety strategy is to learn from the past or to identify the hazards from the event which has happened so that similar hazards will be minimized to acceptable levels for the future. Accident Investigation is a major

source to identify the hazards in reactive safety strategy. Therefore, one of the most important approaches for improvement of safety management is by ensuring quality in accident/incident investigation and complying with the recommendations.

Human factors form the core of accident/incident investigation framework. ICAO Circular Human Factors Digest No. 7: investigation of human factors in accidents and incidents states, “*Human Factors are involved in most aviation occurrences. Thus, to advance aviation safety, we must improve our ability to identify the involvement of Human Factors in accidents and incidents*” (ICAO, 1993). There are various tools used in aviation accident/incident investigation to understand human error (Ergai, 2013). One tool which has been widely used in the aviation industry to investigate and analyze human factor is HFACS (Human Factor Analysis and Classification System) which was developed by Dr. Scott Shappell and Dr. Doug Wiegmann. HFACS is recommended by ICAO, The International Society of Air Safety Investigators’ (ISASI), and many other investigation agencies.

To guide development of a robust accident investigation system, Human Factor Digest no.7 of ICAO also reveals a few challenges that might be encountered while investigating HF along with recommendations for best practices to be followed. The first obstacle mentioned that some investigators will believe that human nature cannot be changed, or it will be too difficult to prove that the accident has happened because of human error. The second is that some investigators will believe that they are not human factor experts as they are not medical doctors or psychologists. Active monitoring of these aspects could help enhance the quality of accident investigations.

There are many documents published by ICAO on human factors and the various tools to support the investigation, and human factor aspects have been shown to be a fundamental part of accident and incident investigation. There are various safety and other recommended practices published by ICAO, along with several guidelines published by investigation agencies. However, there is no policy which binds the regulator in the individual country markets, regarding the integration of human factors in the investigation report. This is resulting in most of these guidelines and recommendations not being complied.

The accident investigation reports are the product of safety investigations. The Member States' National Investigating Agencies (NIAs) are expected to publish the investigation report for every accident or major incident, and submission of final report to ICAO is mandatory. However, there is no centralized or regional body to monitor the quality of the investigation or audit the reports.

ICAO Annex 13 recommends a common accident investigation report format which includes four different sections. The first section is about the actual information about the accident/incident, such as the history of the flight, personal information about the crew members, aircraft communication systems, the survival aspects of airport information, and so on. The second part is Analysis. In this section, most developed countries have a standard format that includes the human factor analysis. However, in developing countries, many of the reports do not include the human factor analysis section. This could be one of the reasons why it is not always analyzed satisfactorily. Furthermore, it is likely that there are other factors involved, but they remain unclear (Burban, 2016). The third section is the conclusion where the findings are mentioned, and the fourth section presents the recommendations to prevent similar occurrences (Burban, 2016).

A few studies have reviewed the importance of Human Factors in accidents and the importance of quality investigation report to prevent accident. Husam Kharoufah et.al., 2017 has studied the aviation accident causes with special emphasis on the impact of HF for a period of 16 years with more than 300 accident investigations. Nughara, 2016 has identified the importance of legal

framework and the role of government in Aviation Safety in Indonesia. Burban, 2016 emphasizes on the inclusion of HF in air accident investigations and recommends the use of training need analysis for the investigators. From the above literature study it is evident that just a few research work have been undertaken in the area of accident investigations worldwide; and none have been found for South Asia, which is among the high risk potential region (ICAO, Safety Report , 2020) The literature review undertaken reveals the following gaps that need further investigation:

- a. In reference to the accident investigation, the ‘Analysis’ phase proves to be the crucial link leading to meaningful conclusions and recommendations. However, non-conformance of developing countries to the format recommended by ICAO signals deviation from the requirement of quality. Further probe into this aspect could reveal the existing situation and provide insights into possible areas of action and enable appropriate intervention strategies.
- b. Region-wise comparative studies on accident investigations are found to be non-existent. Considering the frequency and the severity of aviation accidents and incidents in the South Asian region (ICAO, Safety Report , 2020), this study attempts to undertake a systematic assessment of the available investigation reports from various countries in this region in order to provide insights into the accident investigation culture and practices in this region.

It is necessary to address the gaps identified since the findings will not only contribute to enhancing safety and cost effectiveness of aviation operations, but also provide fillip to the overall confidence in the aviation industry.

3. Methodology

In the air transport industry, quality of accident-incident investigation plays a vital role in accident prevention. A quality investigation should analyze all the aspects involved in an accident starting from human factor analysis and ending with the organizational factor analysis. The only objective of this is to learn from the mistakes to avoid future occurrences.

Due to absence of available literature on analysis of accident investigation, an exploratory research design is warranted. Accordingly, the case study method has been used since this research method enables an in-depth exploration of intricate phenomena within the specific context of South Asia (Yassir Rashid, 2019). This region essentially comprises of the developing countries, where the gaps have been identified thereby requiring further investigation.

This research involves a detailed analysis of eighteen accident-incident investigation reports from all the countries of South Asia except Bhutan. Three accident reports from each country (Nepal, India, Bangladesh, Pakistan, Maldives, and Sri Lanka) have been selected randomly from the Civil Aviation Authority’s website. According to the United Nations, Afghanistan is also a part of South Asia, but the state of Afghanistan is not a part of the Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAP). Therefore, the country’s accident-incident report has been excluded from the study. Bhutan’s accident-incident report has not been considered as it was not available on the website.

The investigation reports selected were analyzed based on seven different factors. These factors were considered from the best practices and recommendations from ICAO, ISASI, and leading Investigation Agencies. Each report has been analyzed thoroughly, keeping in mind that not all the information will be available on the report. The seven categories considered include: 1. Ideal time taken for completion of investigation; 2. Deployment of an independent organization for

investigation; 3. Effective investigation technique used; 4. Human factor analysis conducted; 5. Inclusion of human factor expert; 6. Whether root cause of accident/incident was identified.

This study endeavors to use the PDSA (Plan-Do-Study-Act) approach to quality management proposed by ICAO (Safety Management International Collaboration Group, 2018). The contents of the report ('Do') are compared to the 'Plan' as recommended by ICAO. This research is the 'Study' that aims to recommend the areas of 'Action' to enhance quality and safety in the investigations and, thereby, in the aviation sector.

4. Finding and Discussion:

The review of the eighteen investigation reports reveals insufficient details in the required areas and some reports have been closed in less than ten pages. Based on the information available, Table 1 summarizes the details of the analysis country-wise and based on the factors.

Baxter & Jack (2008) suggests that case study methodology helps exploration of the data sources through a variety of lenses in order to reveal multiple facets of the phenomenon. Since the objective of the study is to create a more informative and sophisticated construction, the context-specific (country-wise) and framework-specific (factor-wise) analysis has been undertaken.

4.1 Country-wise Analysis

Reports 1, 2 and 3 have been taken from India. Two of them have been investigated by the Aircraft Accident Investigation Bureau; one investigation has been carried out through the inquiry committee. Two out of three investigations took two years to publish the investigation report and the third investigation was completed in fourteen months. None of the investigations have used any techniques during the investigation. Only one investigation included a HF expert, but human factor analysis has not been undertaken in any of them.

Reports 4, 5 and 6 have been taken from Nepal. All three investigations were completed within a period of twelve months, and all the investigations were carried out by an Investigation Commission formed by the government of Nepal after each accident. Two out of three accidents have not included any techniques during their investigation. No human factor analysis has been conducted, nor has a HF expert been included in any of the three investigations.

Reports 7,8 and 9 have been taken from Pakistan. All three investigations were conducted by the Pakistan investigation board (an independent body for investigation). None of the reports have mentioned the date of completion, so the duration of the investigations is not clear. Two out of three accident investigations have included technique or tool used during the investigation, as mentioned in the reports. However, none involved human factor analysis or HF experts. Generally, the violation of standard operating procedure has been pointed out as the root cause in all three accidents/ incidents, but there is lack of evidence of human factor consideration during the investigations.

Reports 10,11 and 12 are from Sri Lanka, but none of the reports mention the date of completion. All the investigations were completed by a Commission established by the government after the accident or incident. Only one accident investigation has included tools and techniques during the investigation. None of the investigations have considered the human factor analysis nor HF experts in the investigation.

Reports 13,14 and 15 have been taken from the Maldives. One out of the three Accident Investigations has been completed in less than one year. None have used any tools or techniques during the investigation nor considered the human factor or HF experts during the investigations.

Reports 16,17 and 18 have been taken from Bangladesh, with one investigation out of three being completed in less than one year whereas the other two took more than two years. All the investigations were done through an independent body. One out of three investigations have used some tools and techniques along with the human factor analysis. It is not clear from the other two reports whether the human factor was analyzed or if a HF expert was included.

The country-wise analysis reveals that none of the investigations from the entire panel of countries selected covered all the factors as recommended by the aviation bodies. Therefore, the countries in South Asia are clearly falling short of the standards expected for a quality investigation.

4.2 Factor-wise analysis

The first factor is ‘ideal time’ recommended for completion of investigation report to ensure quality. One year has been considered as the ideal time to complete the investigation as per the recommendation from different agencies including ICAO: “*The State conducting the investigation should release the Final Report in the shortest possible time and if possible, within twelve months of the date of the occurrence*” (ICAO Annex 13, 1951). Out of eighteen samples, only five have completed the investigation within the ideal time. Seven out of eighteen have taken more than two years to complete the investigation and six out of eighteen have not mentioned the date of completion in the report. In this category, only 27% of the investigations have followed the recommendations for quality investigation.

The second factor is deployment of an independent organization for the investigation. This is intended to ensure completion of the investigation in an unbiased and blame-free manner, as mentioned in ICAO Annex 13. In most of the countries in South Asia, the regulators provide the investigation service in the aviation industry. For example, the regulators of the country which provide the Air Traffic Control (ATC) service, or operate the airports, also provide the investigation service. Therefore, if they are deployed to do the investigation, there is a strong likelihood that the findings may be biased as the investigation team will not investigate the regulator’s part. For this reason, ICAO recommends that the investigation should be carried out by an independent organization, and that this body be established by the country. In this analysis, eight out of eighteen (44%), investigations have been completed by an independent organization, whereas 50% of the incidents have been conducted by an Investigation Team formed by the state, to which mostly the regulator’s employees are assigned. One investigation (6%) has been completed by an Inquiry Commission.

According to ICAO, accident/ incident investigation needs be conducted by independent national investigation authorities. In case the state does not have an independent agency, the state should form an independent team to investigate, with the sole objective of accident prevention. ICAO motivates the countries to be a part of regional cooperatives for the common challenges in the regions. In South Asia, Cooperative Development of Operational Safety and Continuing Airworthiness Programs (COSCAPs) have been established to support the member countries by exchanging their resources. South Asia Regional Accident Investigation Organizations have also been formed for effective investigation in the region by pooling essential resources (ICAO, 2021). This program started in 1997 and currently there are seven countries in the South Asian Association for Regional Cooperation (SAARC), out of which only six states (Nepal, Bhutan, Pakistan, Bangladesh, Sri Lanka and Maldives) are currently active (COSCAP, 2021). These provisions could be activated for the formation of an effective and efficient neutral investigative body that could provide the required skills and resources for a quality investigation.

The third factor analyzed in this research is the use of effective techniques during the investigation. Useful or effective investigation techniques are stipulated by ICAO (ICAO Annex 13, 1951, p. 36). Only five out of eighteen (27%) have used one or more of these effective techniques during the investigation. Ten out of eighteen (56%) investigations have clearly mentioned that no techniques were used, whereas three out of eighteen (17%) have not mentioned anything. According to the research conducted among investigators in Europe, *“42% of investigators were not taught what data they should collect, which is an issue considering the nature of the investigation and the gathering of evidence. Similarly, for 27% of respondents, their training did not include 'tools and methods', which is an essential part of accident investigation”* (Burban, 2016, p. 118). Lack of training could be one reason for not including the effective techniques during the investigation.

The fourth factor analyzed in this report is the human factor analysis included in the investigation. Five out of eighteen (27%) have included the human factor analysis in the investigation whereas twelve out of eighteen (67%) have not included this factor, and one report is not clear. As mentioned in Table 1, most of investigations which have used some techniques have included the human factor analysis. However, the percentage of investigations that have considered this is still low (27%).

The fifth factor deals with the inclusion of human factor (HF) experts during the investigation. Only four out of eighteen (less than 20%) have included a HF expert while eleven out of eighteen (more than 50%) have not included one and, in three out of eighteen (16%), the report does not show any evidence of whether a HF expert was included or not. The two criteria -human factor analysis and inclusion of HF experts- are directly correlated. Whenever a HF expert is included, it is expected that human factor analysis would be conducted. Therefore, it is recommended that a HF expert be included. However, it is observed that in one accident investigation from Nepal (Nepal airlines accident in Lukla) some part of a human factor analysis was included albeit carried out by a non-HF expert since a HF expert was not included. Such a human factor analysis may lack the depth required and, hence, may not be complete.

The last factor of this research is ‘a root cause identification of accident or incident based on the report’. After the careful analysis of each part of the reports, only four out of eighteen (22%) were found to have investigated the root cause of the accident/incident. More than 60% of the investigations have not identified the root cause of the accident. Two out of eighteen reports did not indicate clearly whether the investigation had identified the root cause or not.

All factors identified and recommended by the world safety bodies need to be complied to effectively maintain and improve safety in a critical sector such as aviation. However, as indicated by the reports, the quality of investigations in the South Asia region clearly shows serious gaps that warrant immediate attention and action.

Based on the factors recommended for a quality accident-incident investigation report by the various world bodies, the importance of human factor investigation in accidents cannot be overemphasized. Human error should be the starting point of any accident investigation. Furthermore, investigating human factors should consider the human subjects within their context, and the antecedent organizational factors. Nevertheless, this 360-degree approach, though essential, has been a major challenge in accident investigation (Burban 2016). Quality investigation warrants that this challenge be overcome.

The most important part of an investigation is the report as it provides the distilled inputs whose implementation alone can stop similar kinds of accidents from happening in the future. For a

quality report, the recommendation must be more specific than generic. The reports from the South-Asian countries have more generic recommendations than specific ones. The most reported cause of accident/incident in this region is the non-compliance of the standard operating procedure, but very few reports pin down the reason behind non-compliance.

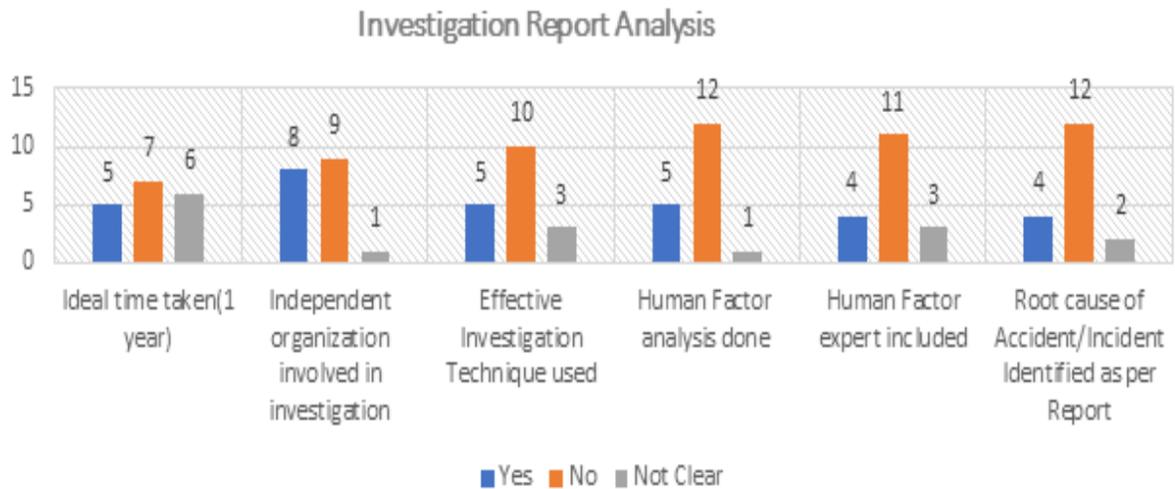


Figure 1: Investigation Report Analysis
Source: Author

Table 1: Selected Investigation Reports- Accident/Incident Report Analysis

Report No.	Accident/Incidents- sources	Duration	Independent Investigation body.	Technique used	H. F expert included	H.F analysis done	Remarks
1.	India- Serious Incident: - Air India and Jet Airways Near Miss Air Proximity due to attempt to land on unassigned RWY at IGI Airport Delhi.(Air India and Jet Airways) (Aircraft Accident Investigation Board-AAIB , 2018)	2 y	Yes	N.C	No	No	Within work place section it is written- This seems very difficult to achieve in moderate to heavy traffic scenario considering human factor issues.
2.	India- Serious Incident:- Air India AI821 from Delhi to Jammu was involved in a serious incident of runway over run after landing on runway (AABI-INDIA, 2018)	1 Y 2 M	Yes	Nil	No	No	Human factor should have been included as it is clearly stated that incident occurred because of Delayed Touchdown.
3	India- Serious Incident: ground collision between M/S Indigo Aircraft VT-IFP (A320) and M/S Kuwait Airways Aircraft 9K-APA (A330-200) at Mumbai Airport (AABI-India, 2018)	2 Y	N.M	Nil	Yes	yes	Human Factor has not been fully analyzed properly as human error has not been touched. But Investigator would have considered HF as they have collected Secondary data about HF They considered Air Accident Investigation Unit published by Ireland. Synoptic

							Report of similar occurrence to Boeing, 737-8AS aircraft(s) with winglets at Dublin Airport, Ireland on 7 October 2014.
4	Nepal- Accident- Nepal Airlines aircraft 9N-ABO Twinotter (DHC6/300)- at Jomsom Airport Nepal (The Commission for the Accident Investigation, 2014).	9 M	No	Nil	No	No	In Review analysis section 2.4 it has been mentioned that the mechanical, external and human factors which could have contributed to the accident were reviewed and analyzed. Each of them is explained categorically but investigators have not explained anything related to human factors in the report. In Section 1.5.1.1- The probable cause behind the occurrence of the event was pointed out as being that the incident appears to have occurred due to human factors.
5	Nepal- Accident of 9N-AKY, LET-410 owned by Goma Air	1 Y	No	Nil	N.C	Yes	Investigators have included the Human Factor and Latent

	Nepal during landing at Lukla airport. (Accident Investigation Commission Nepal, 2018)						unsafe conditions in sec. 2.3.6 under Analysis section and mostly discussed the pilots' and copilots' dream and their normal behavior. HF expert required in this accident to find the root cause of human error.
6	Nepal-Accident: US Bangla Airlines flight DHC-8-402, S2-AGU, BS- 211 from Dhaka to Kathmandu crashed at Tribhuvan International Airport, Kathmandu (Accident Investigation Commission Nepal, 2018)	10 M	No	yes	yes	Yes.	Investigation report met all the standards recommended by major investigation Agencies.
7	Pakistan- Incident Near Miss between Saudi Airlines flight SVA734B772 PIA203 ON 05-02-2018. (Pakistan Investigation Board, 2018)	N.M	Yes PIB	Nil	N.M	No	As the report has mentioned the cause is situational awareness, HF investigation should have been a must. Full investigation has been completed in 10 pages.
8	Pakistan- Serious Incident: PIAC Flight PK-390 Shutdown on lineup at JIAP karachi (Pakistan Investigation Board, 2017).	N.M	Yes PIB	yes	N.M	No	This report has clearly mentioned that the aircraft was released to service with the aforementioned un-safe

							airworthiness status. Consequently, the engine failed after taxi out. Human Factor Ingestion ignored (Total no. of pages: 8)
9	Pakistan-Accident – B1900 D Aircraft belly landing ON 18 th March , 2016 AT JIAP, KARACHI (Pakistan Investigation Board, 2016)	N.M	Yes PIB	yes	N.M	No	Report has mentioned that pilot did not follow the SOP but it has not been investigated why SOP was not followed.
10	Sri Lanka- Incident of Sri Lankan Airlines Flight UL134, Airbus A320-200, at Tiruchirappalli International Airport (Director General of Civil Aviation – CAA, Sri Lanka, 2015)	N.M	No	Yes	No	No	The main cause has been mentioned as violation of SOP. Investigation should have investigated why crew did not adhere to SOP so that a similar kind of accident can be prevented.
11	Sri Lanka- Incident of Mihin Lanka Flight MJ 408 (SHJ – CMB), Airbus A321 (Director General of Civil Aviation – CAA, Sri Lanka, 2015)	N.M	No	Nil	No	No	This incident is a clear case of human factor involvement, where investigators concluded this report with fatigue as major Cause. HF investigation should have been done to find out the root cause to mitigate the issues. Recommendation has been more focused on

							SMS Training instead of recommending particular training for mitigation.
12	Sri Lanka- Incident of Millennium Airlines Cessna Aircraft, model 152, bearing registration 4R-DJD at Colombo Airport, Ratmalana (Director General of Civil Aviation – CAA, Sri Lanka, 2014)	N.M	No	No	No	No	Even though the probable cause has been identified as a maintenance issue, none of the recommendation was made for maintenance. Not clear on H.F
13	Maldives -Serious Incident Villa Air flight VP 661, an ATR 72-600 8Q-VAS : loss of control after touchdown, to Gan International Airport (Accident Investigation Coordinating Committee- Maldives , 2015)	6 M	No-	NO	No	No	Detailed analysis has not been mentioned in report.
14	Maldives- Accident 8Q-TMK (TWIN OTTER) At the Ibrahim Nasir International Airport, (Accident Investigation Coordinating Committee- Maldives, 2015)	21 M	No	N.C	No	No	As the cause of accident states “ there was no reason for banking the a/c while landing”, Investigators should have investigated in detail.
15.	Maldives-Accident: Flight FLT371301, a Viking Air DHC-6-300 8Q-MAN, crashed into the sea approximately 3 km southeast of Destination airport Kuredu (Accident Investigation	1 Y 6 M	No	Nil	No	No	This report has mentioned four different causes of this accident where three reasons are violation of SOP and one reason is

	Coordinating Committee-Maldives)						mismatch between human and machine where investigator should have investigated in detail.
16	Bangladesh-True Aviation-AN 26B Flight S2-AGZ21 Cox's Bazar. (Aircraft Accident Investigation Group of Bangladesh (AAIG-BD), 2016)	Less than 1 y	yes	No	N.C	N.C	Probable cause mentioned as non-adherence of SOP. Modification of training recommended. Safety recommendations should have been more specific
17	Bangladesh- Accident- Cessna 152 Flying Academy Shah Makhdum Airport, Rajshahi. (Aircraft Accident Investigation Group of Bangladesh (AAIG-BD), 2017)	2 Y 1 M	Yes	yes	yes	yes	The Primary cause of Accident is Fatigue as mentioned in the report and safety recommendation to revise the duty time limitation for instructor pilot is recommended to authority.
18	Bangladesh- Accident- EC B4 Helicopter crash, Mark S2-AHW of ATL Aviation, Godagari,. (Aircraft Accident Investigation Group of Bangladesh (AAIG-BD), 2020)	2 Y	Yes	N.C	yes	yes	Technical failure of the aircraft but none of the recommendations was made for compliance monitoring.

Y= Year, M= Months, N.M- Not Mentioned, N.C= Not Clear

5. Conclusion:

The case study analysis of eighteen Accident/ Incident Reports from South Asia reviewed the various requirements of a quality report including the inclusion of human factors during the investigation. Most of the accidents/incidents were different in nature and were investigated by different agencies. Some accidents have not been investigated by any investigation body or committee; instead, the Director General of Civil Aviation in those countries has conducted the investigation, which is against the safety policy and standards. The investigations which were conducted by the third-party investigation teams are found to have better results in root cause identification and analysis. It is worthy of note that the investigations which have conducted the human factor analysis have got to the root cause of the accident/ incident. This indicates that HF analysis could prove to be one of the most critical factors for quality investigation.

The study findings support the need for compliance of safety and recommended practice (SARPs) of ICAO. A comprehensive study of this nature has not been undertaken in the past. This study will draw the attention of the regulators or the government of the countries in South Asia to improve the compliance strategy in Accident investigation to render diagnostic value to the report. Furthermore, the results suggest that the government should put in place a mechanism to ensure that actionable recommendations are made along with supporting facts, so that appropriate intervention strategies can be developed for improvement of overall aviation safety (Nughara, 2016). As per the existing policy the respective government/ aviation/ investigation body is required to submit the report to ICAO after completion of the investigation. However, there is no evidence of the compliance or quality check of the report since no reopening of the investigation cases has been found due to non-compliance of standard recommendations. At the level of the investigators, it is suggested that their awareness of the importance of inclusion of different factors in the report be emphasized so that we build 'quality at source' (Burban, 2016).

In a nutshell, the inclusion of human factors, and following the guidelines and safety recommendations from ICAO are basic requirements for a quality report. Various questions have arisen from this study: why the states are not following the guidelines: why HF investigation is not mandatory: why the South Asia Regional Accident Investigation forum is not supporting the states: why states are not willing to pool their resources for better investigations, and so on. Further research into these gaps can unearth valuable information to improve the quality culture and management in this critical sector. In-depth research by ICAO into these macro areas can contribute significantly to promote safety and quality in South Asia. No country should be left behind in terms of safety and quality; in this globalized world, world-wide aviation safety can only be as strong as the weakest link.

6. References

- AABI-INDIA. (2018). *Accident Investigatio-AirIndia AI821*. New Delhi: Aircraft Accident Investigation Board.
- AABI-India. (2018). *Serious Incident, Indgo and Kuwait Air Ground collision*. New Delhi: Committee of Inquiry.
- Accident Investigation Commission Nepal. (2018). *Accident Investigation Report of US Bangla UBG 211*. Kathmandu: Accident Investigation Commission Nepal.
- Accident Investigation Commission Nepal. (2018). *Final Report of Accident 9N-AKY LET 410*. Kathmandu: Government of Nepal.

- Accident Investigation Coordinating Committee- Maldives . (2015). *INCIDENT REPORT ON 8Q-VAS (ATR 72-212A)*. Addu City: Accident Investigation Coordinating Committee- Maldives
- Accident Investigation Coordinating Committee- Maldives. (2015). *ACCIDENT REPORT ON 8Q-TMK (TWIN OTTER)*. Male: Accident Investigation Coordinating Committee- Maldives .
- Accident Investigation Coordinating Committee- Maldives. (n.d.). *Accident Report 2015/04 8Q-MAN*. Male: Accident Investigation Coordinating Committee- Maldives .
- Aircraft Accident Investigation Board-AAIB . (2018). *AirIndia and Jet Airways near miss*. New Delhi: AAIB -India.
- Aircraft Accident Investigation Group of Bangladesh (AAIG-BD). (2016). *Final Report of Aircraft AN-26B; Flight S2-AGZ21*. Dhaka: Aircraft Accident Investigation Group of Bangladesh (AAIG-BD).
- Aircraft Accident Investigation Group of Bangladesh (AAIG-BD). (2017). *Final Report of Cessna 152 Flying Academy*. Dhaka: Aircraft Accident Investigation Group of Bangladesh (AAIG-BD).
- Aircraft Accident Investigation Group of Bangladesh (AAIG-BD). (2020). *Final Report of EC B4 Helicopter crash*. Dhaka: MINISTRY OF CIVIL AVIATION & TOURISM office of Aircraft Accident Investigation Group of Bangladesh.
- Burban, C. (2016). *HUMAN FACTORS IN AIR ACCIDENT INVESTIGATION*:. U.K: Cranfield University.
- COSCAP. (2021). *28th COSCAP-SA STEERING COMMITTEE MEETING*. Bangkok : COSCAP.
- Director General of Civil Aviation – CAA, Sri Lanka. (2014). *Incident of Millennium Airlines Cessna Aircraft, model 152*. Colombo: Director General of Civil Aviation – CAA, Sri Lanka.
- Director General of Civil Aviation – CAA, Sri Lanka. (2015). *Final Report of Incident of SriLankan Airlines UL 134*. Colombo: Director General of Civil Aviation – CAA, Sri Lanka.
- Director General of Civil Aviation – CAA, Sri Lanka. (2015). *Incident of Mihin Lanka Flight MJ 408 (SHJ – CMB)*. Colombo: Director General of Civil Aviation – CAA, Sri Lanka.
- Ergai, A. (2013). *Assessment of the Human Factors Analysis and Classification System (HFACS): Intra-rater and Inter-rater Reliability*. Clemson: Clemson University.
- Husam Kharoufah a, J. M. (2017). A review of human factors causations in commercial air transport accidents. *Elsevier* , 1-13.
- ICAO. (1993). *HUMAN FACTORS DIGEST NO.7 Investigation of Human Factors in Accidents and Incidents*. Montreal: International Civil Aviation organisation .
- ICAO. (2017). *DOC 9859* . Montreal: ICAO.
- ICAO. (2021, 01 31). *ICAO*. Retrieved from ICAO: <https://www.icao.int/safety/Implementation/Pages/COSCAPs-RSOOs-RAIOs.aspx>
- ICAO Annex 13. (1951). *ANNEX 13*. Montreal: International Civil Aviation organisation.

- ICAO, Safety Report . (2020). *Safety Report*. Montreal: ICAO. Retrieved from https://www.icao.int/safety/Documents/ICAO_SR_2020_final_web.pdf
- International Civil Aviation Authority. (2017). *DOC 9859*. Montreal: ICAO.
- International Civil Aviation Organisation. (2015). *Manual of Aircraft Accident and incident Investigation*. Canada: International civil aviation organisation.
- International Civil Aviation Organization . (1951). *ANNEX 13*. Montreal: International Civil Aviation organisation.
- Nepal Government . (2014). *FINAL REPORT ON THE ACCIDENT INVESTIGATION OF 9N-ABO*. Kathmandu: THE COMMISSION FOR THE ACCIDENT INVESTIGATION.
- Nughara, R. A. (2016). Improving Aviation Safety in Indonesia: How many more accident? *Halrev*, 328-348.
- Pakistan Investigation Board. (2016). *ACCIDENT OF M/S. AIRCRAFT SALES AND SERVICES BEECHCRAFT-1900D AIRCRAFT*. Islamabad: Pakistan Investigation Board.
- Pakistan Investigation Board. (2017). *SERIOUS INCIDENT OF PIAC FLIGHT PK-390*. Islamabad: Pakistan Investigation Board.
- Pakistan Investigation Board. (2018). *Incident Report of Saudi Airline and Pakistan Internation* . Islamabad : Pakistan Investigation Board.
- Safety Managent International Colaboration Group. (2018). *Safety Management System and Quality Management System Relationship*. None: Safety Managent International Colaboration Group. Retrieved from <https://skybrary.aero/bookshelf/books/4620.pdf>
- Skybrary. (2020, November 23). *Flight Safety Foundation*. Retrieved from Sky brary: https://www.skybrary.aero/index.php/Quality_System
- The Commission for the Accident Investigation. (2014). *FINAL REPORT ON THE ACCIDENT INVESTIGATION OF 9N-ABO*. Kathmandu: Government of Nepal.
- Yassir Rashid, A. R. (2019). Case Study Method: A Step-by-Step Guide for Business Researchers. *Case Study Method: A Step-by-Step Guide for Business Researchers*, 1-13. doi:<https://doi.org/10.1177/1609406919862424>