Organizational Factors in Aviation Safety Management Failures: the Case of Indonesia

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On 28 July 2007, the European Union (EU) banned Indonesian airlines from flying to Europe. This threatened reputations, and caused psychosocial harm and economic damage to the country. The ban was imposed because: (1) there were verified serious operating deficiencies in all certified airlines in Indonesia; (2) the US FAA downgraded Indonesia's IASA safety rating; (3) the ICAO USOAP identified serious shortcomings in the ability of the Indonesian authorities to perform their safety oversight responsibilities; and (4) the ability of the Indonesian authorities to properly implement and enforce safety standards. These deficiencies were further evidenced by the high accident and incident rates.

The aims of this study were to: develop a reasoned and logical understanding of the causes of a series of accidents or incidents in the Indonesian air transport system; and contribute to the knowledge of aviation safety management failures.

The study was grounded in a synthesis of theories of organizational failure and learning. Based on this framework, discourse analysis was employed to examine *how* the airline safety environment changed over time. This study developed an understanding of the social and organizational construction of safety management in the Indonesian air transport system.

In sum, this study presented empirical evidence of: the origins of the Indonesian aircraft accidents and incidents; the deteriorating of Indonesian air transport safety management; how the vulnerability of a system may, sooner or later, lead to a crisis; and four barriers to learning from accidents.

Keywords: aircraft accident, air transport system, organizational learning, deficiencies, system failure

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Glossary

AAG	: Accident Analysis Group
AEP	: Airport Emergency Procedures
AOG	: Aircraft on Grounded
ARRB	: Audit Result Report Board
ATC	: Air Traffic Controller
BASARNAS	: *Badan* Search and Rescue *Nasional*
BMG	: *Badan Meteorologi dan Geofisika*
CAA	: Civil Aviation Authority
CAP	: Corrective Action Plan
CASR	: Civil Aviation Safety Regulations
CSA	: Comprehensive Safety Analysis
DGCA	: Directorate General of Civil Aviation
EC	: European Commission
EKKT/ETTS	: *Evaluasi Keselamatan dan Keamanan Transportasi* or Evaluation transport safety and security
EU	: European Union
FAA	: Federal Aviation Association
HFACS	: Human Factors Analysis and Classification System
HRT	: High Reliability Theory
IASA	: International Aviation Safety Assessment
IATA	: International Air Transport Association
ICAO	: International Civil Aviation Organization
ICVM	: ICAO Coordinated Validation Mission
IRS	: Inertial Reference System
KKN/CCN	: *Korupsi, Kolusi dan Nepotisme* or Corruption, Collusion and Nepotism
KNKT/NTSC	: *Komite Nasional Keselamatan Transportasi* or National Transport Safety Committee
LCC	: Low Cost Carrier
LEI	: Lack of Effective Implementation

MAATS	: Makassar Advance Air Traffic Service
MMD	: Man-made Disaster
NAT	: Nature Accident Theory
NDT	: Normal Deviance Theory
NTSB	: National Transportation Safety Board
SARP	: Standards and Recommended Procedures
SFCRM	: System Failure and Culture Readjustment Model
SOP	: Standard Operational Procedures
USOAP	: Universal Safety Oversight Audit Programme

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Chapter 1
Introduction

1.1 Background

On 28th July 2007 the European Union (EU) announced that it would impose an operating ban to all Indonesian airlines. The operating ban forbade all Indonesian airlines from commercial services to European countries because the EU had verified evidence of deficiencies in Indonesian aviation safety. Consequently, the operating ban impaired reputations of Indonesia, created fear, uncertainty and chaos in the country. Furthermore, it also caused psycho-social harm and economic damage (Department of Transportation, 2008). Indonesia, and especially the aviation industry, was in shock.

According to the EU Press Release from Brussels, IP/07/1014 on 4th July 2007, the Vice-President in charge of transport, Jacques Barrot said,

> "*Once more, the EU black list will prove to be an essential tool not only to prevent unsafe airlines from flying to Europe and to inform passengers travelling worldwide but also to make sure that airlines and civil aviation authorities take appropriate actions to improve safety*."

In reference to Barrot's statement, it clearly stated that there were airlines, including Indonesian airlines, facing safety issues.

The reasons for the operating ban were elaborated in the Official Journal of the European Union on 5th July 2007. There were four reasons stated: (1) there were verified serious deficiencies in all certified airlines in Indonesia; (2) the United States Federal Aviation Association (FAA) downgraded the Indonesian safety rating in its International Aviation Safety Assistance (IASA) programme; (3) the ICAO Universal Safety Oversight Audit Programme (USOAP) indicated there were serious shortcomings in the ability of the Indonesian civil aviation authority to perform its safety oversight responsibilities; and (4) there was insufficient ability in the Indonesian authorities to implement and enforce the safety standards.

Furthermore, the high rate of accidents and incidents in Indonesia contributed to the downgrade, with a global accident rate that rose from 0.65 in 2006 to 0.75 in 2007 (IATA, 2008). The USOAP audit was conducted by ICAO on 6–15 February 2007. It pointed out not only serious shortcomings in the Indonesian civil aviation authority's ability to achieve safety standards, but also lack of effective implementation (LEI) in eight critical elements. There were deficiencies in the areas of aviation regulations, human and technical/technological resources and the authority's enforcement of safety standards.

Thus, without a doubt, the deficiencies in the system that were evident by the high accident and incident rates, indicating there must be something wrong in the system. Similarly, Fink (1986) said that accidents and incidents were evidence of vulnerability in a system and also notified the presence of problems in the system. Reason (1990, 1997) identified that vulnerability in a system was not only caused by active failures but also by hidden conditions.

In summary, the safety issues in the Indonesian air transport system are the *raison d'être* for this study. Consequently, the Indonesian air transport system was examined to:

> Understand how the phenomenon of high accidents and incidents rate in Indonesia developed.

1.2 Rationale and Significance of the Study

Studies on aviation accident have developed significantly. In 1990, Reason's introduction of the concept of an organizational accident (1990, 1997), in fact, gave a new perspective on accident studies, particularly in aviation. This concept took the perspective that aviation accident studies were not only about human errors or technical failures but also a combination of multiple-causal factors that interacted with each other. Thus, there was a process occurring before an accident or incident happened.

An aviation organization is near-unique, but has parallels, notably medicine, which in the UK and the USA, employs error reporting systems. However, what marks aviation out is that it is reliability-seeking and also demands high performance (both operationally and financially). Because of these 'error-free' performance and effectiveness requirements aviation organizations aim to be high-integrity organization (Westrum & Adamski, 2010).

High integrity systems like other complex systems are surrounded by a human envelope that has three elements: operations, maintenance and design. A strong human envelop facilitates a

strong, high-integrity system but if it is weak then the system will be fragile and vulnerable. Thus, if there is a high-integrity system in which accidents or incidents were likely to occur, one or more of these principles were compromised (Westrum & Adamski, 2010) or, in other words, there are adaptations' breakdowns to cope with complexity (Woods et al., 2010).

Drawing on failure theories, Reason (1990, 1997) identified there are a period in which active failures and hidden conditions interact to weaken a system before an accident or incident occurs. This argument aligns with what Man-Made Disaster (MMD) theorists (Turner, 1978; Turner & Pidgeon, 1997) refer to as the incubation period. Both theories see an accident as a product of the linear breakdown of system defences; therefore strengthening layers of defences will enhance safety. These concepts seemed oversimplified the complexity of a system such as aviation.

Therefore, there is a need to draw insight from socio-technical system theories. Charles Perrow (1984; 1999) developed Normal Accident Theory (NAT) that sees an accident in any interactively complex and tightly-coupled technology system is inevitable. Thus, the higher the degree of system complexity, the higher the potential for accidents achieved. Despite the pessimism of NAT, High Reliability Theory (HRT) (LaPorte, 1996; Roberts, 1990a, 1990b; Roberts, Bea, & Bartles, 2001; Rochlin, 1996) finds that a system with an excellent safety record is a high reliability system. This concept sees that an accident or incident is possibly to be avoided by applying several strategies. Nevertheless, both concepts agree that learning from a failure is essential to understand the complexity and apply lesson learned to enhance safety.

Understanding a complex system from both theories, organizational learning and failure, aimed to fill the needs for considering time to analyse the events – accidents and incidents. Therefore, a development of the system will be understood so any values, beliefs, and norms existed and practiced will be determined.

This study addressed two broad assumptions and an initial model as guidance. Following the development of this study, two broad assumptions were elaborated into four specific assumptions while an initial model became a revised model. Finally, this thesis presents a final model that describes how the Indonesian air transport system was deteriorated through the time.

This study provided empirical evidence of (1) the origin of the Indonesian aircraft accidents and incidents, (2) the deteriorating processes in the Indonesian air transport system, and (3) a model that describes how the Indonesian air transport system was deteriorated. Furthermore, compilation of the various sources used in this research revealed some insights that were not expected at the beginning of this research; there were four barriers to learning to be identified.

Thus, on the basis of the organizational failure and learning theories, particularly in aviation studies, this study addresses new insights to aviation safety management. From a practical perspective, this study will give further consideration to aspects that were not included in prior aviation-related studies.

1.3 Aims of the Present Study

The overall aims of the present study were to develop a reasoned and logical understanding of the causes of a series of accidents or incidents in the Indonesian air transport system; and contribute to the knowledge of aviation safety management failures.

The specific objectives of this research were to:

1. Investigate the origins of Indonesian aircraft accidents and incidents;
2. Investigate how and why Indonesian aviation safety is vulnerable, as evidenced by a series of accidents and incidents in the Indonesian air transport system; and
3. Further develop the knowledge of aviation accident studies through addressing the systemic causes in an air transport system in the context of my theoretical framework.

In order to achieve the research objectives, two research questions are addressed.

1. What is the origin of the Indonesian aircraft accidents and incidents?
2. How did accidents and incidents keep occurring in the Indonesian air transport system?

The objectives and questions above are used to construct assumptions for this study.

1. First Assumption: There is a deteriorating process in the Indonesian air transport system.
2. Second Assumption: A series of accidents and incidents indicate failure to learn.

These assumptions are related to the concepts below:

1. There is a deterioration process before an accident occurs (Reason, 1990, 1997; Toft & Reynolds, 1997; Turner & Pidgeon, 1997)
2. There are accumulated, unnoticed failures in pre-conditions (Pauchant & Mitroff, 1992; Shrivastava, Mitroff, Miller, & Miclani, 1988; Turner & Pidgeon, 1997)
3. Recurrences of the events indicate failures in learning from previous events (Pidgeon & O'Leary, 2000; Sagan, 1993; Toft & Reynolds, 1997)
4. Accidents can lead to crises (Pauchant & Mitroff, 1992)

1.4 Study Approach

This study is typically not concerned with theoretical verification nor justification, but more about developing an understanding of the events through generating empirical grounded theories. This is typical of research into 'theorizing on disasters' (Le Coze, 2008); for example, the works of Turner (1978), Vaughan (1992, 1999, 2004) and Snook (2000) who generated theories about disasters from different cases (the accidents and disasters in the United Kingdom, the Challenger case and Friendly Fire in Iraq). In such exemplar, the theorizing on a disaster approach is based on the scope of the study, which not only involves the micro- and meso-levels but also the macro-level. In the context of the present research, the logic of this approach led to an analysis at the inter-organizational and societal levels applied in the Indonesian air transport system.

1.5 Research Overview

This thesis is structured in seven chapters. Chapter 2 reviews studies on organizational learning and failure. Chapter 3 places the study in context by providing an overview of the global aviation and the Indonesian aviation. Chapter 4 presents the First Field Work of the study. Chapter 5 presents the Second Field Work of the study. Chapter 6 draws together the main findings and interprets them. Chapter 7 concludes this study and gives some thought for future study.

Chapter 2
Organizational Learning and Failure

2.1 Introduction

Organizational studies have captured scholars' attention for the last five decades. It cannot be denied that there are still many aspects in this area need to be explored further. In line with the growth of organizational studies, this chapter presents the organizational studies in the air transport system. This chapter is structured into six sections that describe organizational studies. Section 2.2 describes learning processes in organizations. Section 2.3 describes organizational failure. Section 2.4 describes complex socio-technical systems. Section 2.5 describes organizational studies in aviation. Finally, Section 2.6 summarises the chapter and gives a conclusion.

2.2 Learning Processes

Scholars view learning as something 'new'; for example, a new knowledge that is the result of detection and correction of errors (Argyris, 1976, Argyris & Schön, 1978), an introduction of new systems (Miles, 1982) or an expansion of new ways to look at the world (Stead & Smallman, 1999). Learning processes grow from individuals into systems or organizations. Individuals who are in a system or organization contribute to the learning processes in any group to which they belong. Thus, learning processes in a group of individuals (e.g., a system or an organization) are inseparable from individual learning, but organizational learning cannot be simply seen as cumulative learning of individuals within organizations.

The processes of learning rise through the participations and interactions among individuals in organizations (Easterby-Smith & Lyle, 2011) so learning processes in organizations continue even though members of organizations come and go (Hedberg, 1981). These processes that occur of and within organizations are labelled organizational learning (Tsang, 1997; c.f., Smith and Lyle, 2011).

Shrivastava (1983) summarised organizational learning as 1) the adaptation in which changes are made through readjusting goals, attention and search rules; 2) assumption-sharing in which improvements are obtained by sharing assumptions among members' responses to the environment by detecting errors and correcting them; 3) development of a knowledge base,

defined as a continuing process of developing knowledge of action-outcome relationships; and, finally, 4) institutionalized experience, in which learning processes involve the entire organization.

Nevertheless, these processes vary across organizations according to their choice in how they adjust to a change environment (Miles, 1982), but the objective of these processes is similar: to perform better in order to achieve system or organizational goals.

2.2.1 Learning Loops

The depth of learning applied by organizations has different levels. The most common levels of learning adopted by organizations are single- and double-loop learning. These levels of learning were first discussed by Argyris & Schön (1974, 1978) and have developed a wide-spread acceptance. Two additional levels have since been added to the model: zero- and triple-loop learning.

Zero learning level occurs when a fresh problem arises but there is no corrective action taken. This level of learning also called *passive learning* by Toft and Reynolds (1997). Here, the members of organizations simply fail to deal with the problem despite a recognition that something has gone wrong (Bateson, 1973; Snell and Man-Kuen Chak, 1998).

In the next level of learning, *single-loop learning*, people in organizations react to problems that arise. However, they act only in the context of the organization's present policies in order to achieve their current objectives (Argyris & Schön, 1978). So, in this level of learning, the organizational context – policies, norms and objectives – do not change. Single-loop learning deals with routine so corrective actions taken are under management's control. By keeping in their context, organizations take immediate responses in order to manage errors. Consequently, the impacts of this level of learning are not widely spread in organizations; they might only affect specific units of organizations.

Higher level of learning leads organizations to react and adapt to any changes not only by detecting and correcting errors, but also by modifying their present policies, norms, and possibly objectives. This level of learning is called *double-loop learning* (Argyris & Schön, 1978). It is seen by Snell and Man-Kuen Chak (1998) as a transformation process and might result in a new organizational context. Thus, in this level of learning, members of organizations do not merely seek solutions. They may alter the organizations' context in order to achieve organizational objectives. These members examine their recent context to

gain knowledge. Such an examination will result new insights used to guide organizations in achieving their objectives.

A deeper understanding of the organizational learning by organization yields a higher level of learning. This next level is named *deutero-learning* (Bateson, 1973) or *triple-loop learning* (Flood and Romm, 1996; Snell and Man-Kuen Chak, 1998). Triple-loop learning provides an opportunity for members to participate in developing the infrastructure for learning, which simultaneously develops their competencies and skills to use the infrastructure (Flood and Romm, 1996). Hence, a significant difference from the other three levels of learning is that an organization's members work collectively to establish structures and strategies for learning.

These three levels of learning – single-, double-, and triple-loop – reflect organizations efforts to learning. The efforts to learn is namely *active learning* that refers to organizations that know something but then taking corrective actions (Toft and Reynolds, 1997).

Learning loops above show the depth of learning processes in organization. The loops also present the relationships of individuals and organizations; the higher level of learning in organizations, the deeper involvement of organizations' members with the learning processes. The level of learning also is inseparable with time, in as much as higher levels of learning require more time.

2.2.2 Barriers to Learning

Organizations have the freedom to choose how to respond to problems so adoption of any type of learning is about how organizations take actions. Freedom of choice is inseparable from several existing factors in organizations; for example, an organizations' culture, strategies adopted, and organizational structure. A change in the environment organizations will affect the way organizations see how the world works, its ideologies, norms and behaviour of the organizations. This will often result in a 'new look'.

Facing problems creates new experiences. Organizations use their knowledge in order to cope with any problems that arise. The processes of applying knowledge give new learning experiences to organizations. This type of learning is referred to as *experience-based learning* (Boin, *et al.,* 2005). Similarly, Toft and Reynolds (1997) identified *organization specific learning* as learning in which organizations draw their own lessons from any event in which

they are directly involved. In such case, experiences gained from the event may provide new knowledge to improve the organization.

Problems are, sometimes, unable to be simply resolved. Identifying errors solutions need deeper analysis. Some organizations employ a rational-scientific approach to examine the causes of failures and the effects of the responses taken. Boin *et al.* (2005) categorize this type of learning as *explanation-based learning.* An approach that is commonly used is implementing simple and ready-made tools in order to investigate root cause analysis (Le Coze, 2008). *Competence* or *skill-based learning* (Boin *et* al., 2005) occurs when an organizations are unable to carry out proper examination of the problems by themselves, and choose to seek for help from experts or skilled individuals with particular problems. Finally, if the appropriate lessons are learned by analyzing factors surrounding a particular organizational failure, it is called *isomorphic learning.* On the other hand, wider level of learning is referred to as *iconic learning* (Boin *et al.,* 2005). This scale of learning takes place throughout the whole organization because there is a disastrous event that affects the whole organization. The event itself is a point where learning processes begin.

However, studies show that not all organizations succeed in learning; i.e., there are organizations that fail to learn. Many studies have questioned how and why do organizations succeed and fail to learn. In spite of all efforts to learn, it is undeniable there are barriers to achieve successful learning. Those barriers are not easy to eliminate, but recognizing and anticipating them from the beginning may help organizations to take corrective actions.

Perrow (1984) found that information is one of the barriers identified that may block learning. There is a high ambiguity of perceptions as the result of differences in interpretations of the information available, especially when an organization's secrecy creates restrictions on information flow. Similarly, Vaughan (1996) implicitly stated that there are significant contributions of restricted information or information difficulties in organizational learning. She implies that an organization tends to cover failures within the organization for several reasons, such as protecting the reputation of the organization and preventing financial losses.

In the same way, Pidgeon and O'Leary (2000) found information difficulties a barrier to learning since high uncertainty, higher levels of complexities, and poor structures in a system undermine attempts to learn. There are misunderstandings resulting from wrong assumptions,

inherent difficulties in handling information, ambiguity of regulations and denying danger. All of these will delay corrective action.

Blaming is another barrier in organizational learning (Perrow, 1984, Turner and Pidgeon, 1997, Hale *et al.,* 1997). It is the easiest way to clean up the mess: ask someone to pay the bills. Other barriers may arise when it is in someone's interests to prevent the truth (Perrow, 1984). Thus, scholars have suggested that organizations inability to learn may come about because of the organization, itself.

2.3 Organizational Failure

Prior studies have identified that organizational failure does not occur suddenly, there are degradation processes that occur in organizations and lead to conditions wherein the system loses its capability to cope with unwanted and unplanned events.

Turner (1978) called a period in which the deterioration occurs 'the incubation period'. He highlighted the incubation period as a period in which unintended and complex interactions occur between contributory preconditions to defeat the established safety system (Pidgeon & O'Leary, 2000). He believes that an organization's adoption of norms, culture and belief is essential in constructing a safety culture in an organization. The discrepancy of these values over a period of time will degrade the organization's ability to cope with hazards.

This posited degradation process in an organization agrees with the work of Toft and Reynolds (1997). They defined the degradation that occurs as a complex combination of technical, individual, group, organizational and social factors, including culture, affected assumptions and practices. These can be the aetiology of a disaster (Toft & Reynolds, 1997). At this point, they believed that disaster was created by people operating within a complex system (Toft & Reynolds, 1997) when the values adopted lead to failures.

The concepts of incubation or precondition, described above, were similar to the organizational accident theory suggested by Reason (1990, 1997). He also agreed that there was a process of weakening in an organizational body that led to a state of vulnerability. Thus, there is a period in any disaster where the organization is weakened by some failures. Such degradation occurs as a combination of multiple aspects such as people, technology and social factors, which affect assumptions and practices within the system. All aspects may work together to increase complexities and, in time, an accident or incident occurs.

In the incubation period, there are degradation processes in organization that cause changes to values, norms and beliefs adopted by organizations. Consequently, the safety culture within the organization is affected. Uttal (1983) states that safety culture is about shared values (what is important), beliefs (how things work) and behavioural norms (the way we do things here). The first two elements interact with the organization's structures and control systems to create the last element. Similarly, Mitroff et al. (1989) define that the culture of an organization as a set of rarely articulated, largely unconscious beliefs, norms, and fundamental assumptions that the organization makes about itself, the nature of people, in general, and its environment.

Reason (1997, p. 113) addresses the importance of a well-established safety culture in any organization. He notes how changes of the top management or the organization's leaders will affect commitment of the organization as a whole to improve and maintain a certain safety level as every leader has different goals or objectives. So, safety culture refers to what an organization is like in term of safety and inseparable from the management involvements (Dien, Dechi, Guillaume,2012).

Degradation processes affect the assumptions and practices, which are related to the safety culture developed in an organization. Thus, it works in conjunction with the establishment of any cultural elements. These are not immediate and instant but, rather, a lengthy process in which these elements are established, and become widespread and pervasive. Hence, time is an important aspect in both the degradation process and the establishment of safety culture.

2.4 Complex Socio-Technical System

Post-modern society has witnessed large-scale accidents; for example, Chernobyl, the Challenger and the Columbia space-shuttle accidents, and many more major aircraft accidents. The sophisticated design of a socio-technical system, such as aviation, leads to complex interactions amongst system components, many of which cannot be easily anticipated.

Several scholars have suggested various causes by which systems become complex (see Perrow, 1984; Rasmussen, 1997; Vicente, 1999, Kirwan, 2001). For example, the non-linear nature of a system often confers unpredictable behaviours, and a small change in any one part of a system has the potential to change the whole system drastically. Likewise, the growth of a system through time will bring difficulties in predicting what will happen in the future, so

uncertainties increase complexity. Moreover, improvements to increase system efficiency and effectiveness will, naturally, also create complexity, as do changes in system design that may be caused by changes in requirements or by the environment. In such systems, there are complex interactions between social (e.g., multiple interacting parties, stakeholders), technological (e.g., various technical disciplines, automations) and environmental (e.g., market pressures, political interests) aspects. Consequently, complex socio-technical systems create high hazards with potential for high impact accidents. For these reasons, learning is essential in complex system.

2.4.1 Learning in Complex Socio-Technical System

Complexities in these systems are not easy to manage. Many scholars have examined major accidents in order to improve the understanding of such the complexities. For example, the first contemporary study on accidents was carried out by Barry Turner (1978), who examined 84 accident and disaster reports published by British Government sources in the period from 1 January 1965 to 31 December 1975. Turner found that organizations have shifted their view of the world after the past events. Therefore, learning processes will re-adjust organizations' beliefs and norms.

Another study conducted by Perrow (1979) after Three Miles Accident in 28 March 1979 provided new insights on complex system studies. For him, an accident is 'inevitable' or 'normal' in such system, particularly in *interactively complex* and *tightly-coupled* system. Perrow states that a system with interactive complexity is unable to recognise and predict independent failure events. If this system is also tightly-coupled, then the failure events will quickly become uncontrollable and cause a system-wide accident. Hence, these two dimensions act together to create unplanned, unwanted and unexpected failures, sooner or later, leading to an accident.

Berkeley scholars (e.g., Roberts, Weick, La Porte) have examined several complex socio-technical system; for example, the US Air Traffic Control (ATC), two aircraft carriers, an utility grid management system, the Diablo Canyon nuclear plant and fire-fighter teams (LaPorte & Consolini, 1991). They defined a high reliability organization as an organization with a good safety record or, in other words, an organization with the ability to deal with risks. A specific successful experience that avoided a catastrophe was used as an indicator when claiming the "reliability" of the organization. Learning extensively from experiences of accidents, incidents and near-misses (LaPorte, 1996; LaPorte & Consolini, 1991) and

translating the lessons learnt into practice (Pidgeon, 1997) are some strategies to improve the reliability of an organization.

In contrast, some scholars indicate their pessimism regarding learning from an accident or incident experience (Caroll, 1995). They viewed each accident and incident as unique and, therefore, have unique causes behind accidents and incidents. Reason (1997) argued that complex systems do not learn. While he found that actors in the system, in this case air transport industries (e.g., pilots, regulators), attempt to learn from any accident and incident, there was a tendency to learn just on the surface. However, the accumulation of intense learning from the past events (accidents, incidents and near-misses) has succeeded in reducing the aviation accident rate and improving aviation safety levels (Ballesteros, 2007).

Hence, learning processes in complex socio-technical system are not merely about one unit, one organization or one system but also experiences from a set of systems or events.

2.4.2 Failure in Complex Socio-Technical System

Studying failure in a complex socio-technical system is a challenge because underlying causes of accidents and incidents in this system are often due to a complex interaction between actors at all levels in the system (Rasmussen and Svedung, 2000). Therefore, one should consider the nature of the system so the event is not seen as a sudden occurrence but, instead, a consequence of processes that occurred over a period of time.

Understanding failure in complex socio-technical system is inseparable from investigation. An *event* occurs if the safety of a system falls below its safety level, which is possibly caused by technology, persons, socio and technical subsystem, and dysfunctional relationship between organizations. These factors are also marked the development of studies on system's failure – technical period, human error period, socio-technical period (Reason, 1993), and the latest period, inter-organizational relationship period, was added by Wilpert and Fahlbruch (1998). Once an accident or incident occurs in a complex socio-technical system, an analysis will be carried out in order to understand how the event developed. This is known as an *event analysis*. The analysis determines the causes of the event and proposes corrective actions to enhance safety in the system.

The study of how a complex system works needs a comprehensive analysis. An event – accident or incident – is only a starting point to determine direct and immediate causes. By analysing backward, as far as possible, the analysis moves from direct causes towards root

organizational causes. Thus, failure should be understood from historical dimension (temporal aspects), organizational networks, and vertical (hierarchical) relationship in the organization (Dien and Llory, 2006). At this point, the understanding is developed through carrying an investigation.

2.4.2.1 Accident and Incident

Everyone might think they know what an accident or incident is, but there are differences in perceptions and definitions. What an accident is for one person may not be one for someone else. An important aspect of accident definition is the context. Centuries ago, an accident was seen as an 'Act of God,' as this explanation came from religious beliefs and superstitions when things went wrong. Since then, the development of knowledge and technologies worked in conjunction with an understanding of accidents and, also, incidents. Consequently, definitions of accidents and incidents have been refined.

Perrow (1999, p. 70) defines accidents and incidents based on their consequences, either causing damage to property and/or injuring persons. An incident has a smaller impact compared to an accident; it only damages part of the system, while an accident damages a subsystem or even the whole system. An accident may result in the immediate shutdown of the system or even lead to a catastrophic situation if the consequences are large enough. Similarly, Strauch (2004, p. 24) views an accident or an incident according to its impact; an accident has more severe consequences than an incident.

Wells and Rondrigues (2003, p. 74) define that an incident as a near-accident. Both have similar causal factors since all accidents begin as near-accidents. In regards to the transformation of incidents to accidents, and agree with Hendrick and Benner (1987, p. 27), who describe an accident as a process of transformation of a stable state activity to an unintended state, with a harmful outcome. This process occurs as a result of a group of dynamic-interactive and interconnected events. Similarly, Reason (1990, 1997) sees the process as a series of actions and conditions that interacted each other to weaken system defences. He illustrated this process by using slices of cheese; hence, this model is now widely known as the 'Swiss Cheese Model'.

Although an accident or incident has various definitions, scholars agree that it is an outcome of deviations from the usual interaction of actions and conditions. This core definition of an accident has aided in the development of an understanding of accident causation.

2.4.2.2 Crisis

As noted, an accident in a complex socio-technical system could easily lead to a system-wide accident, especially, if the system is highly interactive and tightly-coupled (Perrow, 1984). Thus, a pervasive impact of an accident is its potential to lead to a crisis as it emerges from threats, urgency and destruction that are often on a monumental scale (Seeger, Sellnow, & Ulmer, 2003). Although a crisis can occur slowly or suddenly, it always causes loss whether physical, emotional or financial and is able to threaten reputations (Seymour & Moore, 2000).

There is no one single definition for a crisis that is accepted universally (Mitroff, Pearson, & Harrington, 1996). Crisis is defined differently in many studies although scholars generally agree that a crisis affects the entire organization as there are always sudden changes in an organization that are unpredictable, and which cause uncertainties and shock in the organization.

In socio-technical systems, a crisis is based on the event's origin and impact. For example, Mitroff, Shrivastava and Edwadia (1987) founded that a corporate crisis was able to cause extensive damage to human life, nature and the social environment. The crisis, itself, was the result of a disaster precipitated by people, organizational structures, or technology. Human agencies were also named as the cause of an industrial crisis and this type of crisis sometimes has effects beyond geographic boundaries and even into the next generation (Shrivastava et al., 1988). In contrast to previous studies, Pauchant and Mitroff (1992) defined a crisis according to the impacts of disruption. A minor impact to the system is caused by an incident that only occurred in a subsystem, where accidents and crises affect the whole system. But, an accident only affects the entire system physically while a crisis affects the entire system physically and symbolically.

In relation to socio-technical systems, Seeger et al. (2003) defined three categories of causes of a crisis. The first group of crises occurs as the result of a complex, tightly-coupled technological system. Because, in this system, an accident is unavoidable, it is called Normal Accident or an Inevitable Accident (Perrow, 1984). The second group of crises are those caused by failure in foresight (Turner, 1978; Turner & Pidgeon, 1997). These were fundamental failures to observe or attend to some emerging risk as the result of some inaccuracy in norms and beliefs. The third group are crises that occur are the result of failures in decision-making processes or breakdown in decision vigilance (Janis, 1972).

Thus, a crisis occurs where there are deteriorating conditions inside a system that are uncontrollable. Pauchant and Mitroff (1992) stated at least two conditions were needed: (1) the whole system is being affected physically, and (2) there is a deterioration in members' basic assumptions in which they were forced to realize the faulty foundation of their current assumptions. Ray (1999) has suggest that a crisis is created by the organization's imperfection and vulnerability to its environment, while Turner (1978) explained that the organization's imperfection is a result of false assumptions, poor communication, cultural lag and misplaced optimism.

Therefore, prior to a crisis, there are a set of preconditions – accumulated failures – that may come from internal or external failures of technology, humans and organization (Shrivastava et al., 1988), early warning signals (Fink, 1986; Pearson & Mitroff, 1993), or even the operational, regulations and risk perceptions (Pearson & Clair, 1998). These failures have the potential to be unnoticed (Tarn, Wen, & Stephen, 2008; Turner, 1978; Turner & Pidgeon, 1997). However, prior to accidents, a system always sends early warning signals (Fink, 1986; Pearson & Mitroff, 1993) that are produced from the long-term interaction of social, psychological, and cultural factors (Seeger et al., 2003) and complex interactions of technological and structural elements (Perrow, 1984). Nevertheless, these warning signals are, occasionally, ignored or overlooked.

2.5 Organizational Studies in Aviation

The first commercial aviation accident occurred on 10 January 1954. The aircraft, a de Havilland DH-106 Comet, operated by BOAC, crashed off the coast of Italy, killing 39 passengers and crew. This fatality warned the aviation community of the need to improve safety. Early research in aviation safety focused on mechanical or technical failures and new inventions in aircraft technology succeeded in reducing the number of accidents caused by technical faults. Recently, the development in aviation safety studies used organizational learning concepts to improve safety and, in fact, this approach succeeds to improve safety in aviation operations (Balesteros, 2007).

2.5.1 After-the-Fact

Learning in aviation studies means to improve safety because safety is a crucial element in any complex socio-technical organization and it is engineered into a system (Huber *et al.* 2008).

Definition of safety varies with people, but it is universally accepted that safety means dealing with hazards and their associated risks, which is not always easy but is, nevertheless, still possible to achieve. The United States Supreme Court (1972) notes that being safe is not the equivalent of being risk-free. In contrast, the Royal Society Study Group (1992, p. 6) defines the concept of safety as freedom from risks that could not be guaranteed, even if the risk was accepted when judged against some criterion of acceptability.

Harms-Ringdahl (2004) sees safety as a prominent feature in a complex system. In commercial aviation, safety is one of the priorities and most important characteristics (Janic, 2000; Netjasov & Janic, 2008). The ICAO defined safety as,

> *'the state in which risk of harm to persons or property damage was reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management'* (ICAO, 2006, p. 11).

Like the U.S. Supreme Court, this definition does not equate safety and freedom from all risks; only that risk is controlled at an acceptable level. However, ever since "the Glider King", Otto Lilienthal, invented the glider in 1891 and was killed in one of his experiments, world air transport has faced the same problem: **accidents**. Therefore, investigation into aviation accidents is essential to improve aviation safety because, without improvement, occurrences will be high and likely to continue.

2.5.1.1 Investigation

An investigation of aircraft accidents or incidents is aimed at determining probable causes and recommending control measures (Wells & Rondrigues, 2003, p. 134). For those reasons, an aviation accident investigation should be used only for preventing a recurrence in the future without any intention to apportion blame or liability (ICAO, 2001). However, Perrow (1986a, p. 146) concluded, according to his experience, that there was a strong tendency to blame operators who committed errors in almost all accident investigations.

An investigation is after-the-fact analysis that is started from an event; in this case, either an accident or incident. From the event, the analysis will trace back any factors connected to the event. Thus, it follows what Dekker et al. (2011) have labelled a "Newtonian" approach to investigation. The Newtonian approach looks for equality between cause and effect. So, a chain of causal reasoning is established from a premise to a single outcome along linear processes. This approach tends to simplify the reasons behind an accident or incident. Dien et al. (2012) noted that such an approach often used for event analysis. This is known as the

event-chain approach. Applying this approach will result in a picture that shows how a single event is connected to its causes. These causes can be, and often are, interlinked. They may even overlap; i.e., they may be present at the same time with effects of mutual strengthening or reduction.

Sagan (1994) stated that an investigation should not only focus on organizational systems after accidents but also investigate the organizations' safety systems. Likewise, an investigation should also consider the historical background and unfavourable organizational contexts (Dien, Llory, & Montmayeul, 2004).

Le Coze (2008) proposed an approach to accident investigation based on different levels of analysis; whether the focus will be at the micro level (human error), meso level (collective and organizational level), or macro level (inter-organizational and social level). These levels of analysis will affect the type of data collected, whether it will be from a normative perspective (data should fit the model) or use a descriptive strategy (the model should fit the data).

Consequently, there were different methods or models applied to investigate an aircraft accident or incident. Netjasov and Janic (2008) placed these accident assessment models into four categories: causal models (e.g., Fault Tree Analysis, Common Cause Analysis, Bayesian Belief Network), collision risk models (e.g., The Reich-Marks Model, The Intersection Model, The Geometric Conflict Model), human error models (e.g., HAZOP, HEART, HFACS) and third-party risks, which normally used statistical analysis to define risks to persons and the area surrounding airports (e.g., the NTSB analysis estimated the probability of being killed by an aircraft crash around an airport and measured the risk around Amsterdam's Schipol airport, which included the individual risk, the societal risk and the risk of potential loss of life over the year). These models used technical applications in an investigation and aim to understand an accident or incident to improve safety.

Smart (2004) claimed that aviation accident investigation practices and procedures were able to establish public and industry trust. These were applicable to other modes of transport because the aviation world has been standardised internationally since a standard of investigation from the ICAO – Annex 13 – was adopted as a framework by all contracting States.

Ascertaining the causes of an accident and using safety recommendations from the investigation to mitigate the cause may prevent a future accident. Janic (2000) stated that a safe or unsafe system is seen from its ability to deal with factors that cause an accident or incident to happen. A system is considered as unsafe if an accident occurred due to known and avoidable factors. However, a system was considered safe if the causes of an accident were unknown and had unavoidable factors. Hence, although there were difficulties in conducting aircraft accident investigations because they generally arose from a complex system that was mutually dependent on each part (Owen, 1998), an aircraft accident or incident should be investigated to determine causal factors and produce safety recommendation to guide corrective actions and prevent recurrences.

2.5.1.2 Biases

Investigating an event may lead to biases because investigators or analysts already know the outcome. Dien et al. (2012), for example, noted the possibility of investigators or analysts not being neutral while they were conducting an investigation. These weaknesses will affect the investigation so any lessons learned from the event might need to be questioned.

Hindsight bias is believed to influence how people learn from an accident or incident. Scholars (for example, Weick, 1995, Reason, 1990) demonstrated how hindsight bias steered humans understanding of an event when they know the outcome. This bias blocks one's ability to study the deeper story of systemic factors that led to that outcome (Woods et al., 2010). So, a judgment is made based on the outcome known (Baron & Hersey, 1988; Lipshitz, 1989), which can lead to an oversimplification of the causal factors. This bias is hard to remove, but Dekker (2006) stated that there is possibility to overcome the bias by using, for example, methods to identify factors that tended to influence the behaviour of the people in a situation before the outcome is known.

The second potential bias is *local rationality*. Human beings perform according to their view of situations and use their knowledge to achieve their goals (Woods et al., 1994) but this can lead to restricted investigation and short-sighted determinations. As with hindsight bias, the investigation into an event often ignores this issue because investigators know the outcome. The most immediate and (to the investigators) most apparent decisions are regarded as the failures that led to the outcome. For example, a pilot decided to land his aircraft instead of 'go-around', which was caused an accident. Investigating this accident would lead to blaming the pilot because he made the fateful decision and, thus, the conclusion of the cause of that

accident was that it was human error (pilot error). At this point, the investigators have oversimplified the causes of an accident because their knowledge of the outcome led them directly to judge that pilot committed an error. Instead, they should investigate further and determine why he took that decision. Therefore, examining the situation in order to understand how and why a decision was taken is essential in an investigation.

In sum, these biases should be considered both when conducting an investigation and when judging the validity of the lessons learned.

2.5.2 Degradation of an Air Transport System

2.5.2.1 The Causes of Accidents and Incidents

It is not surprising that the aviation industry and investigators have also viewed human error as a cause of an accident. Human error is a very elusive concept (Woods et.al, 2010, p. xv) and it first emerged at the Flight Safety Foundation 28th Annual Seminar in 1974. In the following year, the IATA 20th Technical Conference focused on the theme of human error and human factors in aviation safety. At this point, human error was defined as a deviation from expected human performance (Allnutt, 1976; Chapanis, 1972; Goldberg, 1984; Peters, 1966; Senders & Moray, 1991) that resulted in accidents. Later, Rasmussen & Pedersen (1984), Perrow (1984) and Reason (1990, 1997) argued that although human error was a cause of accidents, it could be as the consequence of system characteristics.

So, here, there were two different perspectives on human error. The conventional perspective sees human error as a cause of an accident but a more contemporary perspective views human error as a consequence of multiple-causalities occurring prior to an accident. Woods et al. (2010) has discussed two of these perspectives: the Ptolomaic world view and Copernican world view. *Ptolomaic* world view leads to a focus on people because a safe system means eliminating any potential for errors. In this view, the system has to be protected from unreliable people. Once an accident or incident occurs, they will seek 'who' is responsible for the event. In contrast, *Copernican* world view sees people as part of a system that is working together to create safety. Thus, enhancing safety is an accumulative effort of people in the system to cope with complexities. At this point, instead of blaming the humans, the Copernicans' view complexity as the enemy of safety.

It is noteworthy, here, that research shows that the human contribution to aircraft accidents is approximately 70% (Boeing Commercial Airplanes, 2007; McFadden, 1996; McFadden &

Hosmane, 2001; McFadden & Towell, 1999) and sometimes up to 80% (Gaur, 2005; Wiegmann, Neil, & Paul, 2001; Wiegmann & Schappell, 2003).

This is simple recognition that people have limits to their abilities and capabilities. Human factor studies aim to understand these limits (Wells & Rondrigues, 2003), which affect human performance. Rasmussen (1982) and Reason (1997, 2008) provide three levels of human performance: skill-based performance, rule-based performance and knowledge-based performance. The classification is based on psychological and situational variables.

Skill-based performance reflects individual routine tasks (Reason, 1997, 2008) or familiar activity and can become unconscious behaviour (Rasmussen, 1983). Routine activity helps build individual skills; thus, a person becomes familiar with his or her tasks and unconsciously also develops behaviour. In skilled-based performance, possible reasons for any failure or mistake tend to be failures of attention or lapses of memory (Reason, 1997). *Rule-based performance* presents a mix of consciousness and unconsciousness behaviour (Reason, 1997). Reason (1997, p. 75) defined six behaviours of an individual in the performance of his tasks. His performances can be correct or in error if he meets with good rules, bad rules or even no rules. Furthermore, Rasmussen (1983) stated that errors in this category often occur in highly structured tasks that consists of lots procedures. The last category is *knowledge-based performance* – that is, conscious behaviour (Reason, 1997) – and generally results from a shortage or limitation of knowledge of how to react in unfamiliar situations (Rasmussen, 1983). Here, error often occurs as result of information shortage or inadequate training to deal with new tasks.

The classification of human performance described above indicates that poor performance is not only caused by individuals but also influenced by situation around them. Recent development in accident causation study regards an accident as a product of the complexity of people's activities in an organizational and technical context. Accidents are not simply viewed as consequences of human and mechanical failures. Instead, accident causes also include organizational factors, such as norms and procedures.

Reviewing aviation accident causation studies, there were some classifications on the most probable causes of aviation accidents or incidents. For example, the most probable causes of aircraft accidents or incidents are: human errors, mechanical failures, hazardous weather, sabotage and military operations (Janic, 2000; Wells, 1997; Wells & Rondrigues, 2003). Similarly, the Office of Technology and Assessment (OTA) accident model (Wells &

Rondrigues, 2003, p. 135) places human performance in operations (controller and pilot capabilities) as the primary safety indicator, together with weather, traffic environment, aircraft capabilities and unpredictable events (e.g., sabotage, terrorism). The secondary level comprises the organizational influences in operations. The most distal category to an event is the tertiary category, a broad category that includes federal policy (regulations and budget), values, economics and commercial aviation industry policy (goals, acceptable costs). Although there were classifications on the most probable causes of aviation accidents, these classifications do not aim to point out a single cause because these factors mostly act together to result an accident.

However, studies of accidents and incidents have shown that understanding failure is inseparable from the world views on safety. People with a Copernican world view will not stop their investigation after they find 'Eureka Parts' (Langewiesche, 1998) – parts or people who cause an accident or incident - but they will seek reasons behind these causes. They will go deeper in order to understand not only 'what' caused the event, but also to seek 'how' these causes worked and developed together. In contrast, people with a Ptolomeic world view only seek the Eureka Parts; once they find these causes, they stop the investigation and focus on determining control measures. Those investigators with a Copernican world view identify not only the direct or immediate causes of accidents and incidents, but also contributory factors and systemic causes inherent in the system or contributing to the system.

2.5.2.2 Organizational Influence in Accidents and Incidents

The review thus far underscore that the study of aviation accident causation cannot be separated from a concept of organizational accidents, first introduced by James Reason (1997). On its release, Reason's organizational accident theory provided a fresh perspective on aviation accident studies. His theory, in fact, had a major impact on the study of aviation accidents. However, O'Hare (2000) criticised the applicability of the theory in practice. He developed a model, called the 'Wheel of Misfortune' that he proposed would fill Reason's theory gap. The O'Hare model was based on Helmreich's (1990) concentric spheres. But lately, Reason's "Swiss Cheese Model" had been developed further, by Wiegmann and Shappel (2003), to include the influence of the organization in an aviation accident. Their model was named the Human Factors Analysis and Classification System (HFACS) and is able to measure the organizational influence in an accident. HFACS has provided validation for Reason's theory of organizational influence in accident creation by applying this model in

Federal Aviation Administration (FAA) and National Aeronautics and Space Administration (NASA) research (Netjasov & Janic, 2008).

Several studies have applied the HFACS model to investigate aviation accidents in different countries and have demonstrated the significant contributions of organizations to aviation accidents. For example, Gaur (2005) examined Indian aircraft accidents by analysing 48 accidents and stated there were 52.1% of organizational influences in Indian aviation accidents, while Li, Harris and Yu (2008), who examined 41 commercial aviation accidents in the Republic of China, describe a significant contributing relationship of operational errors within the higher levels of organizations. In Germany, Dambier and Hilkenbein (2006) stated that organizational factors in aviation accidents were much lower than in India, at only 15%, which might be caused by differences in recording data between the two countries.

However, the concept of organizational accident that was emerged after Reason's accident causation model was introduced still views an accident as produced by a linear proces. The concept views an accident as the result of each layer of system's defense breaking-down. This happens slowly as the system has been weakened by latent conditions until all layers of defense have broken. Such a system becomes vulnerable to any unsafe acts and it is likely to lead to an accident. Reason compared this to a resident pathogen to illustrate the weakened processes in the system. Consequently, reviewing this concept, *strengthening the layered defense* or *applying defense in-depth* will increase system's reliability.

As a high-integrity system (Westrum & Adamski, 2010), aviation depends on personnel in operations, maintenance and design. This type of system also applies 'error-free' performance concept. Although there is no system is completely that immune to errors, there is always a potential to increase its reliability and resilience through consistent efforts to seek the best strategies applied to enhance safety.

Since there are complex interactions among parts in the air transport system, control is essential to manage errors, from the engineering level (e.g., automation) to the administrative level (e.g., procedures) (Wells & Rondrigues, 2003). There are various strategies that they proposed to improve people performance in the aviation operations; for example, establishing appropriate recruitment system to attract qualified and competent people to conduct tasks in aviation operations, and maintaining and improving knowledge of people recruited by providing training.

This re-conceptualization has shifted people's views regarding accidents as a consequence of processes occurring in a system in which people are involved either as direct causes or indirect contributors. Recent developments in the aviation accident studies have shifted the view of accident as a consequence of events to a view that an accident emerges from the multiple interaction of factors in the system, such as people's activities, objectives of an organization, and limited available resources.

2.6 Summary

An accident in a complex socio-technical system such as aviation is always a possibility since there are interactions of parts that cannot be anticipated, managed and controlled. It is not a single, linear process, but a dynamic set of complex open-ended and interactive processes. These processes, or pre-conditions, occur as a complex combination of technical, individual, group, organizational and social factors that work together with culture to affect assumptions and practices. The degradation process in an organization works in conjunction with the establishment of any cultural elements. It is not created instantly but within a lengthy period. The discrepancy of these values over a period of time will degrade the organization's ability to cope with hazards which then result in an accident. Therefore, once an accident or incident occurs, there is a need to learn from it, so an immediate action to manage it can be applied. However, there are barriers to learning that need to be considered. Thus, failure to manage an accident or incident and to learn how to improve a system may lead not only to disaster but, possibly, move it even faster into a crisis.

Chapter 3
Context of Study

This chapter illustrates the setting of this study in seven sections. Section 3.1 describes global strategy for aviation safety. Section 3.2 describes Safety Oversight Audit Program. Section 3.3 describes the growth of the Indonesian air transport system. Section 3.4 describes accidents and incidents of commercial aircrafts in Indonesia. Section 3.5 describes the National Transport Safety Committee in Indonesia. Section 3.6 introduces an initial model developed to guide this study. Finally, Section 3.7 summarises and gives a conclusion.

3.1 Global Strategy for Aviation Safety

Safety is essential, and it is important to continuously promote safety in aviation. Thus, in May 2005, a consultation between the Air Navigation Commission of the ICAO with industry resulted in the formation of the Industry Safety Strategy Group (ISSG), which aims to collaborate and define strategies to enhance safety. Its members include: the Airports Council International (ACI), Airbus, Boeing, the Civil Air Navigation Services Organization (CANSO), the Flight Safety Foundation, the International Air Transport Association (IATA), and the International Federation of Airline Pilots Associations (IFALPA).

This collaboration led to the development of a Global Aviation Safety Road Map, an action plan to manage safety in the aviation industry, which has primary objective is to provide a common frame of reference for all stakeholders, including States, regulators, airline operators, airports, aircraft manufactures, pilot associations, safety organizations and air traffic service providers. In particular, the roadmap aims to assist all stakeholders with the implementation of harmonised, consistent and coherent safety oversight and processes following the dynamic changes in aviation. Hence, information is the key to success to achieve all objectives. All information provided by all stakeholders will be treated confidentially but is accessible by authorised parties.

Therefore, all stakeholders are responsible to achieve specific indicators and milestones that are provided by the roadmap. The program is a continuous cycle; it provides not only past-event but also current-state information and future plans of States, regions or industry.

To be more precise, each group has different key focus areas, as follows (referring to the Global Aviation Safety Roadmap ICAO):

For States, the key focus areas are: inconsistent implementation of international standards, inconsistent regulatory oversight, impediments to reporting of errors and incidents, and ineffective incident and accident investigation.

For regions, the key focus area is: inconsistent coordination of regional programmes

For industry, the key focus areas are: impediments to reporting and analysing errors and incidents, inconsistent use of safety management system, inconsistent compliance with regulatory requirements, inconsistent adoption of industry best practice, non-alignment of industry safety strategies, and insufficient numbers of qualified personnel, and gaps in use of technology to enhance safety.

In sum, the road map of global aviation safety is a guideline for all elements in world aviation to enhance global aviation safety.

3.2 Safety Oversight Audit Program

In relation to the roadmap of global aviation safety, the ICAO developed the USOAP to understand a State's status in implementation of safety with respect to compliance with international standards. The program was launched in January 1999, which aims to promote global aviation safety in all ICAO Member States through conducting regular audits of safety oversight system in each State. This program was developed to include safety-related provisions in all safety-related Annexes and the Chicago Convention (CC). In 2005, the program developed the USOAP Comprehensive Systems Approach (CSA) as a guideline to provide comprehensive audits in any State.

There are eight Critical Elements (CEs) to determine the level of effective and consistent implementation of the CEs. The CEs include:

1. Critical Element 1 (CE-1): Primary aviation legislation,
2. Critical Element 2 (CE-2): Specific operating regulations,
3. Critical Element 3 (CE-3): Civil aviation system and safety oversight functions,
4. Critical Element 4 (CE-4): Qualification and training of technical staff,

5. Critical Element 5 (CE-5): Procedures and technical licensing guidance,

6. Critical Element 6 (CE-6): Licensing and certification obligations,

7. Critical Element 7 (CE-7): Surveillance obligations,

8. Critical Element 8 (CE-8): Resolution of safety concerns.

The CEs are elaborated in the audit protocol questionnaires according to the CC, SARPs established in the safety-related Annexes to the CC and any associated ICAO guidance material including, but not limited to ICAO Doc. 9734, the establishment of a State's Safety Oversight System (ICAO, 2010). The questionnaires aim to standardize the conduct of audits and also the main tools to assess the State's safety oversight capability.

There were 135 states, which have been audited by the ICAO for the period of 2005 to August 2009. All finding of the reports were stated in the USOAP CSA report. So, this report is used to identify the Lack of Effective Implementation (LEI) of safety-related SARPs, associated procedures and guidance material. Based on the report, recommendations are formulated. The audit findings, including Significant Safety Concerns (SSCs), and recommendations will be addressed to the State so that, if required, they can be used to provide a Corrective Action Plan (CAP).

The CAP provides information on actions of how a State plans to solve safety deficiencies, including a timeline for completing each action. The CAP is addressed to the Chief of Safety Oversight Program (SOA) within 60 days of the receipt of the interim safety oversight audit report. The implementation of the CAP will be audited through an ICAO Coordinated Validation Mission (ICVM) that aims to determine the status of corrective or mitigating measures taken by a State to address safety deficiencies, including SSCs identified in the USOAP report (ICAO, 2009). The audit result will determine a level of lack of effective implementation (iLEI). According to all audit results (the USOAP CAS and ICVM), the Audit Result Report Board (ARRB) will make the summary to the ICAO regarding to the current condition of the State. Considering the audit results, the ARRB will recommend further action to the ICAO; for example, whether a State will be removed from the list on safety issues, or remains in the list and needs further actions to improve the system safety.

3.3 The Growth of the Indonesian Aviation

The Indonesian commercial aviation era began four years after Indonesian Independence Day, in 1945, with the launch of the country's airline, Garuda Indonesia (GI) on 26th January 1949. There were two regulations issued by the Dutch government used to provide general framework of the Indonesian aviation operations. The regulations were: 1) the Regulation on Aviation 1932 (*Luchrvervoer-besluit*) that was issued on 13th February 1933. This regulation was revised by the *Staatsblad* No.118/1933; and 2) the Ordinance on aviation 1934 (*Luchtvervoer-ordonanntie*), which later was revised by the *Staadsblad* No.2005/1934 and the *Staadsblad* No.36/1942. Specifically, the aviation operations were regulated by the Ordinance No.100/1939 (*Luchtvervoer-ordonanntie*) that has five sections and forty paragraphs to provide a detailed framework for aviation operations.

On 27th December 1958, the government replaced prior regulations but the Ordinance on aviation No.100/1939. The new regulation was the Act no.83/1958, which was the first legislation in aviation after the Indonesian Independence Day. The Act has eight sections and 28 paragraphs that provided more details to regulate the Indonesian aviation; for example the terminology in aviation operation (e.g., accident, aircraft).

To provide a comprehensive framework in aviation, the government issued the Act No.15/1992 to replace the Act No.83/1958. The new Act has, 76 paragraphs, compared to the Act No. 8. The Act No.15/1992 provided comprehensive explanation on the aviation operations; for example, visions and missions of the Indonesian aviation and procedures of investigation, aircraft registration, airport and environmental impacts. The Act No.15/1992 had given significant impact to the growth of the Indonesian aviation market because it was able to provide a guideline to the aviation operations.

Nevertheless, the Act did not provide operational guidelines for commercial airlines. Therefore, the government issued the Government Regulation No.40/1995 on Air Transport on 17th November 1995 and the regulation was in conjunction with the Explanation of the Law. The regulation provided detailed information on commercial aviation; for example, definition of an airline, airline's registration and operation, routes and hubs, licensing requirements, sanction, tariff and special services for disabled customers. Those explanations were elaborated into 10 sections and 49 paragraphs.

In 2000, a Ministerial Decree of the Ministry of Transportation No.10/2000 on the licensing of airlines was issued that stimulated Indonesian aviation industry. Thus, new entrants were able to enter the Indonesian aviation market and this brought in the Low Cost Carrier (LCC). This type of airline operated a low cost concept that was more affordable compared to fully-serviced flights. The two new entrants introducing this concept were Jatayu Airlines and Lion Air. According to the Ministry of Transportation report in 2008, the LCC increased the growth of aircraft departures. Five years since the issuance of the Ministerial Decree, the growth in 2006 increased 169.72%. Furthermore, the growth in aviation industry was also supported by the growths of the national GDP and, in particular, the increase of household expenditure for domestic travelling by plane for leisure (Statistics Indonesia, 2010).

In the period 1997-1998, the reformation year, the economical and political instability affected the growth of aircraft movements. But, a year after 1998, there were positive impacts in the whole country, including the aviation sector. The government attempted to stimulate the economy by issuing the Act on antimonopoly No. 5/1999 that opened privatization in industries, including aviation. Specifically, the aviation was growing rapidly as the government deregulated the aviation industry by issuing Ministerial Decree of the Minister of Transportation No. 95/1999 to reform the transportation sectors including air, water and land transports.

The significant growth of the aviation industry reached its peak in 2003 following the growth of scheduled commercial service airlines (See Figure 5.2). The growth of aircraft movement was there until 2006 although the number of airlines operated was reduced every year in the period of 2004-2006. Two severe accidents in the beginning of 2007 affected the number of aircraft movements. Those accidents also affected the number of the scheduled commercial service airlines because the government imposed penalties to some airlines as a result of the safety audit conducted by the government (Ministry of Transportation, 2008). Examples of the penalties were: imposing Aircraft on Grounded (AOG), reviewing airworthiness licenses and revocation of airlines' licenses.

Figure 3.1 Number of Aircraft Movements in Indonesia 1996 – 2009

(Source: Ministry of Transportation of the Republic of Indonesia, 2010)

Figure 3.2 The Growth of the Indonesian airlines 1998 - 2009

(Source: Ministry of Transportation of the Republic of Indonesia, 2010)

3.4 Accidents and Incidents of Commercial Aircraft in Indonesia

Following the growth of aviation activities, there was a significant growth of incidents and accidents in Indonesia. The terminology of accident and incident used in this study is according to ICAO Annex 13, below:

Table 3.1 Terminology of accident, incident and serious incident according to the ICAO (Annex 13)

Events	When	Who/What	How
Accident	The time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked	a person is fatally or seriously injured	a result of being in the aircraft or direct contact with any part of the aircraft, including parts which become detached from the aircraft or direct exposure to jet blast except when the injuries from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew
		the aircraft sustains damage or structural failure	adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component except for engine failure or damage, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skins (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome)
		the aircraft is missing or is completely inaccessible	
Incident	an occurrence, other than accident, associated with the operation of an aircraft which affects or could affect the safety of operation		
Serious Incident	It takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked	a manned aircraft	There was a high probability of an accident.
	It takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.	an unmanned aircraft	

Janic (2000) stated that rapid growth in air transport often results in a series of accidents. That seemed likely to have happened in Indonesia as was evidenced there by 492 occurrences within ten years (2000-2009). The condition of Indonesian aviation contributed to the global accident rate that rose from 0.65, in 2006, to 0.75, in 2007 as released by the IATA (2008).

The events were only six in 2000 but they rapidly increased to 23 events a year later. From 2002 to 2005, the number of events seemed constant, except for two accidents and one incident in 2004 and 2005. The crash of MD-82 Lion Air PK-LMN in Adi Sumarmo Aiport, Solo had killed 25 people and 137 people injured at the end of 2004. Almost a year after the Solo's crash, in September 2005, a B737-230, operated by Mandala Airlines, failed to become airborne and overran the runway 23 in Polonia Airport, Medan. The aircraft flew close to the ground and impacted several buildings and vehicles in the road before it was destroyed into three parts at the end of the road. The Mandala accident killed 100 passengers and crew on board and also killed 49 people on the ground.

In 2006, the number of events decreased to 35 events comparing to 50 events in 2005. However, the impacts was not as severe as in 2007, when a missing B-737 4QB Adam Air plane and the crash of a B-737 497 Garuda Indonesia plane increased the number of fatalities from 18 fatalities in 2006 to 123 fatalities. Without a doubt, these events and impacts evidenced vulnerabilities in the Indonesian air transport system.

Regarding the high accident and incident rates in all transport modes in Indonesia, the President of the Republic of Indonesia established the National Committee of Evaluation of Transport Safety and Security (NCETSS) or *Komite Nasional Evaluasi Keamanan dan Keselamatan Transportasi* (Komnas-EKKT). The establishment was through the Presidential Decree No.3/2007 that was issued on 11th January 2007. The Decree gave mandates to the Committee to conduct comprehensive investigation to the Indonesian transport system, including regulations, transport safety standards and procedures. The objectives were to determine causes and propose recommendations to improve safety and security in all transport modes in Indonesia.

However, the Committee could not achieve the objectives within the assigned period of three months. Therefore, referring to the Presidential Decree No.16/2007, the working period for the Committee was extended to another six months to provide more time to conduct in-depth investigations.

Figure 3.3 Commercial Aviation Events in Indonesia, 1999 – 2009

(Source: Ministry of Transportation of the Republic of Indonesia, 2010)

Figure 3.4 Commercial Aviation Fatalities and Injuries 1999 – 2009

(Source: Ministry of Transportation of the Republic of Indonesia, 2010)

3.5 The National Transport Safety Committee in Indonesia

The authorised organization to investigate any transport accident and serious incident is the National Transport Safety Committee (NTSC) or *Komite Nasional Keselamatan Transportasi* (KNKT). Prior to 2011, as an organization in the Department of Transportation, the NTSC's was responsible to the Ministry of Transportation of the Republic of Indonesia that regulated and controlled the aviation operations. Since 2011, the NTSC is responsible directly to the President of the Republic of Indonesia.

The NTSC was established according to Presidential Decree No.105 Year 1999. For air transport investigations, prior to the establishment of the NTSC, accidents or incidents were investigated by the Air Transport Accident Investigation Committee (1994 – 1999) and, prior to 1994, by the Directorate General of Air Transport.

As an organization that was under, and directly responsible to, the Ministry of Transportation; the NTSC did not have its own budget, but was included in the Department of Transportation budget. The NTSC's organization and structure was explained in the Ministerial Decree No.46/2004. The Decree has five sections and nineteen paragraphs, which stated the establishment of new units in the NTSC's organization. There is a new unit in the NTSC, the Secretariat that has three sub-units: secretariat; research and investigation; and information and internal affairs.

Prior to 2010, the NTSC only investigated serious incidents and accidents, so the Directorate of Airworthiness Certification (DAC) investigated incidents. Investigation of aircraft accidents or incidents in Indonesia comply with the ICAO Annex 13 and its Standards and Recommended Practices (SARPs), and the ICAO Manual of Aircraft Accident and Incident Investigation (Doc 9756). Prior to 2008, there was no manual produced by the NTSC for investigations. So the investigation process relied on the ICAO Annex 13 and Civil Aviation Safety Regulations (CASR) 830.

For providing explanations related to an aircraft accident, aircraft incident and aircraft delay, the Minister of Transport issued a Ministerial Decree No.1/2004 on reporting accident, incident or delaying of aircraft and aircraft accident/incident investigation procedures. The Decree was issued on 13th January 2004 and it has five sections: definitions, notification of event, protecting any item related to the event, reporting the event and investigating procedures.

However, the NTSC's independency, lack of financial support and limited duties to only investigate accident and serious incident, seemed to be issues that were need to be considered by the government so the objectives of investigation of accident and incident will be achieved.

3.6 Initial Model

An initial model was developed based on theoretical guidance (Chapter 2) and preliminary data collected (see Section 3.4). A combination of theories and the preliminary data collected indicated there was something wrong in the Indonesian air transport system. The high accident and incident rate evidenced there were deficiencies in the system. Referring to the theories, these deficiencies led to implications, below.

The first implication of the serious deficiencies was high accident and incident rates. The phenomenon exemplifies Westrum and Adamski's proposition (2010), which states in a high-integrity system (such the air transport), high accident and incident rates that indicate the system is fragile and vulnerable. Similarly, Fink (1986) said that accidents and incidents were evidence of vulnerability in a system and also notified the presence of problems in the system. A combination of the phenomenon, the high accident and incident rates, and the theoretical framework used to develop the first research question and assumption of this study.

The second implication of the serious deficiencies was that accidents and incidents kept occurring. The phenomenon was in line with Perrow (1986a) and Reason (1997). They stated their optimism that airlines are able to learn from accidents and incidents. The optimism was evidenced by Ballesteros (2007) who found that the accumulation of intense learning succeeds in reducing the aviation accident rate and improving aviation safety levels. Therefore, if there is a system in which accidents or incidents keep occurring, the system is indicated failure to learning. A combination of the phenomenon, the high accident and incident rates, and the theoretical framework used to develop the second research question and assumption of this study.

The third implication is a combination of all phenomena: the high accident and incident rates, and the repeat occurrence of events. Together these offer warning signals about the condition of the system (Fink, 1986; Pearson & Mitroff, 1993), these are produced from the long-term interaction of social, psychological, and cultural factors (Seeger et al., 2003) and complex

interaction of technological and structural elements (Perrow, 1984). Therefore, the phenomena above indicated a pre-crisis stage prior to the EU's operating ban, which meant a crisis event as it caused to psycho-social, physical or economic instability in Indonesia. This implication emphasized the analysis of this study to a condition prior to the EU's operating ban.

In summary, the key propositions guiding the study are:

1. There is a deterioration process before an accident occurs (Reason, 1990, 1997; Toft & Reynolds, 1997; Turner & Pidgeon, 1997)
2. There are accumulated, unnoticed failures in pre-conditions (Pauchant & Mitroff, 1992; Shrivastava, Mitroff, Miller, & Miclani, 1988; Turner & Pidgeon, 1997)
3. Recurrences of the events indicate failures in learning from previous events (Pidgeon & O'Leary, 2000; Sagan, 1993; Toft & Reynolds, 1997)
4. Accidents can lead to crises (Pauchant & Mitroff, 1992)

The combination of all together was used to develop the initial model used to guide this study and achieve the objectives of this study. Figure 3.5 is shown, below.

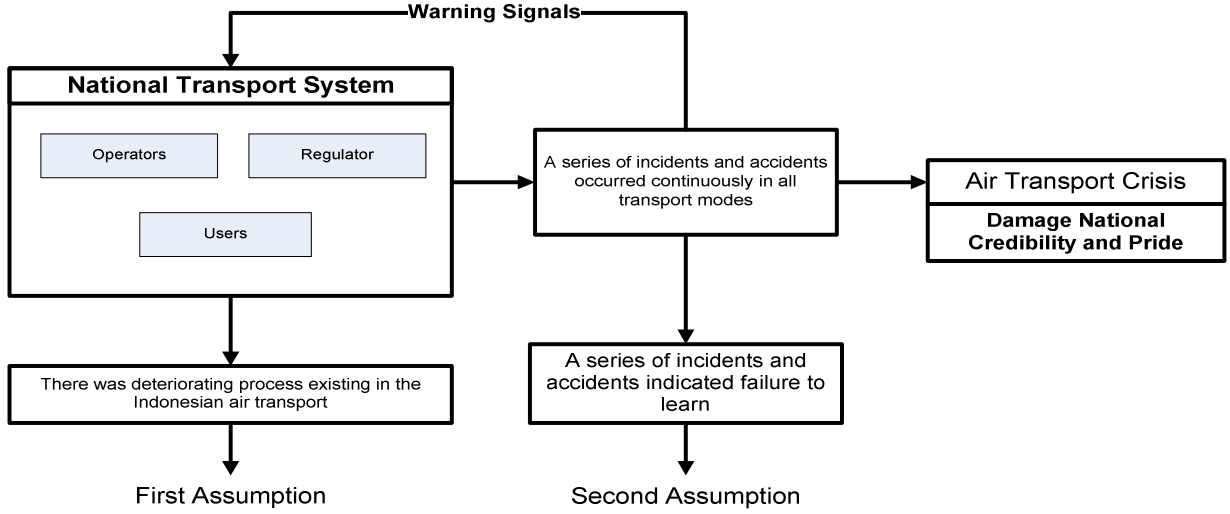

Figure 3.5 The Initial Model

3.7 Summary

The Indonesian aviation grew quickly after the deregulation on transport sector in 1999. Following the growth of the wider aviation industry, Indonesian aviation was faced with accidents and incidents, which caused injuries and fatalities. Comparing to the global aviation safety, the events of accidents and incidents in the Indonesian aviation had affected the

average global safety rate. To understand the events and prevent that similar cases happened in the future, the NTSC investigated the events and proposed safety recommendations. However, the NTSC's issues of dependency, lack of financial support and the limited duties for only investigating accidents and incidents needed to be considered in order to achieve the objectives of investigation.

Chapter 4
First Field Study

This chapter describes the strategy and approach used in first field work of this research. There are six sections in this chapter. Section 4.1 discusses the rational choice of the research method and approach. Section 4.2 describes discourse analysis approach. Section 4.3 describes the method used to generate information, followed by Section 4.4, which describes the method used to analyse the information collected and analysed the first data collected. The first data collected was presented in this section. Section 4.5 describes the development of the initial model in this study. Finally, Section 4.6 summarises the chapter and gives a conclusion.

4.1 Rational Choice of the Research Method and Approach

Conducting research in social science leads to two paradigms used as a basis for choosing approaches. The paradigms are positivism and post-positivism. Positivism is studying social phenomenon by seeking facts and causes that tend to rely on testing of hypotheses. Here, understanding of the phenomenon uses a predetermined set of answers to a question of a certain phenomenon from the researcher's perspectives (Miles & Huberman 1994). In contrast, post-positivism is trying to understand social phenomenon through perspectives of the participant of the research, which are developed subjectively by individuals according to their views on how the world works; for example, through symbols and languages. Thus, the qualitative approach is developed understanding on a phenomenon through an investigative process in which the researcher compiling and comparing participants' perspectives on the phenomenon.

Furthermore, the context of this research needed to be understood. As a starting point, an ontological assumption was set. Blaikie (2000) asserted that an ontology is about claims and assumptions. Those are the nature of social reality, claims about what exists, what it looks like, what units make it up and how these units interact with each other. Air transport system is surrounded by a human envelope (operations, maintenance and design), consequently, this study cannot be separated from the human dimensions relating to the air transport system; for example, values and perceptions on safety. However, understanding the system can never be

an objective process since subjectivity influences how people see the world (e.g., safety, accident) and, of course, interpret meaning. Accordingly, the Indonesian air transport system is viewed as a socially constructed reality.

Air transport system is complex and dynamic and accordingly any change in the system needs to be understood from multiple perspective. Consequently, a post-positivist or interpretive paradigm or qualitative approach is the most suitable method to investigate the phenomenon in the Indonesian air transport system (Barley, 2006; Eisenhardt & Graebner, 2007; Rynes & Gephart, 2004), in particular, by applying a qualitative inductive approach (Eisenhardt & Graebner, 2007). This qualitative inductive approach was applied to develop a theory about the phenomena under investigation.

The method adopted enabled the author to obtain a range of data and to develop and explore a holistic representation of reality through written texts and listening to research participants expressing their perspectives on the social reality of the Indonesian air transport system.

To determine a suitable tool for this research, once the ontological position was set, an epistemology of this research was used to define a framework for ways to obtain knowledge from the social reality.

Epistemological questions refer to what and how knowledge can be obtained about the nature of what exists and how it exists (Grix, 2002, p. 177; Guba, 1990, p. 26). This research fell under a hermeneutic or interpretive position since it tried to understand diverse meanings of a safety concept and its implications in the Indonesian air transport system. Thus, a combination of objectives, norms of practices and epistemological position led this research to discourse analysis approach.

4.2 Discourse Analysis

Qualitative research has a wide variety of strategies to be applied to achieve research objectives. But the researcher's bias in choosing a most suitable strategy is a critical issue that must be considered. So research objectives, norms of practices, and the epistemological position taken will affect qualitative research (Creswell, 2003; Eisenhardt & Graebner, 2007; Rynes & Gephart, 2004). Specifically for the organizational studies, Buchanan and Bryman (2009) stated that not only the above factors need to be considered in choosing a method, but also organizational, historical, political, ethical, evidential, and personal factors. These

factors, by time, developed the setting of this research and reflected a creative process of the research.

Differing from other qualitative approaches (e.g., grounded theory, narrative analysis), discourse analysis is able to identify social functions; not only by analysing the content but also how it is structured and organized. Wetherell et al. (2001) stated that doing social life studies means to do discourse because it is the study of language-in-use and human meaning-making, and it aims at understanding how knowledge is constructed. So 'to do' social life means 'to do' discourse (Wetherell et al., 2001, p. 4).

The conventional approach of discourse analysis focuses on language as an abstract entity. Most recent approaches use both spoken and written forms of language, as used in social practice (Wood & Kroger, 2000). This is in line with Phillips and Hardy (2002, p. 3) who stated,

> *"Social reality was produced and made real through discourses, and social interactions cannot be fully understood without reference to the discourse that gives them meaning".*

Consequently, spoken and written data are interrelated since the actual practice of both speaking and writing is discourse.

Discourse analysis can be applied to research about individuals, organizations and societies since, in use, it endeavours to uncover the ways in which discourse is produced (Phillips & Hardy, 2002). Chia (2000) stated that discourse analysis suited studies about organizations because,

> *"Discourse itself is the form of organization and, therefore, organization analysis is intrinsically discourse analysis".*

Based on this, discourse analysis was, therefore, employed as it was believed it will reveal the social construction that constituted social and organizational life (Phillips & Hardy, 2002) in the context of Indonesian aviation safety management.

4.3 Generating Data

Data in discourse analysis refers to the words spoken (e.g., interview, conversation) and to written text (e.g., reports, emails) because discourse analysis relates to language; it does not refer to language in the abstract, but to language in use (Wood & Kroger, 2000). Yin (2003) suggested the use of multiple sources of evidence with the intention of strengthening and

achieving credibility of the research. The notion of saturation in discourse analysis is 'elastic', so when a researcher reaches the 'end-point', it does not mean that the researcher stops finding new things, but that the data collected were sufficient to make and justify an interesting argument (Wood & Kroger, 2000).

Although it was important to generate a very large amount of data, it was also most important to collect relevant and valuable data within a certain time span in order to achieve the research objectives.

Therefore, an effective and efficient strategy was used to obtain the important data. Data collection and management of data was particularly challenging for discourse analysts (Putnam & Fairhurst, 2001) because of the large amount of data available. It is simply not a matter of deciding which texts to use as data (Phillips & Hardy, 2002). Here, the critical issue faced by a discourse researcher was choosing between texts. It was not only about the choice but also justifying that choice to reviewers (Phillips & Hardy, 2002).

Spoken and written data may be gathered from different sources and situations. First, spoken discourse can be gathered by having conversations face-to-face, via telephone or using media (Wood & Kroger, 2000). Conversations and telephones gathered data directly from the source, such as a conversation at home, school or, office, while telephoning can also be conference calls and calls for information and complaints. Conversely, data gathered using media were secondary data; for example, data from television, film documentaries or voice records. Finally, written texts may be gathered from several sources, such as media articles, reports, minutes of meetings, notes and bills.

4.3.1 Written Discourse

To gather important and relevant information for this study, a broad conceptual framework was used to choose the data required. Phillips and Hardy (2002) stated that texts may be the best constituted data, but it depends on what the researcher is studying. If the research's topic is about an organization then texts that are naturally produced offer advantages over interviews. However, if the topic is about an individual, then an interview is often the best and least problematic approach. Since this research focuses upon broader societal discourses, then texts that were disseminated widely (e.g., government reports, newspapers, magazines) seemed to offer the best sources of data.

This study is similar to prior studies in disasters that used investigation reports for analyse pattern of accidents and disasters; for example, Turner (1978; 1997) analysed 84 accidents and disasters in the UK, he analysed only the reports. Toft (Turner's doctoral student) and Reynolds (1997), extended this type of analysis to include a wider body of data, which strengthened their findings, but they did not strictly account for time and history in their analysis.

Therefore, beside analysing accident and incident investigation reports, to partly fill a gap left by previous studies, this study used articles from the media and other reports or publications. The media articles aimed to provide 'day-to-day' information of the Indonesian air transport system. The reports and publications from credible organizations or institutions would provide information such as Indonesian aviation history and its development. Criteria of each source of data were developed in order to maintain credibility of the study as shown in table 4.1, 4.2 and 4.3, below.

Table 4.1 Selection of media

Selection Criteria	Logical Reasoning
National newspaper/magazines	The scope and percentage of news written were mainly in national context
Cooperation of media	To achieve level of accessibility to gather and collected any related information from the media's databases
Time frame	The time frame of article collected was from beginning of1999 to end of 2007. Beginning of 1999, there were numbers of articles related to establishment of the NTSC. Furthermore, there were numbers of articles until end of 2007 that were provided extensive and comprehensive reports regarding to the EU's operating ban applied to all Indonesian certified airlines.

Table 4.2 Selection of other reports/publications

Selection Criteria	Logical Reasoning
An organization/institution has credibility to provide information-related to aviation operations	To maintain the credibility of the reports or publications produced
Accessibility	To achieve level of accessibility to gather and collected any related information from the organization's or institution's databases

Table 4.3 Selection of accident/incident cases

Selection Criteria	Logical Reasoning
Case study is an official report from the investigation bureau in Indonesia	To maintain credibility of the report
The events occurring between 1999 to 2007	The NTSC was established in 1999, therefore aviation accident and incident investigation officially started in 1999. The operating ban was announced in July 2007 after a series of incidents and accidents occurred in Indonesia and used as a top event in Indonesian aviation. Thus, the time frame 1999-2007 was used to guide this research (see details in Chapter 2)
Case study is officially published by the NTSC in their website and/or had been announced to the public	Therefore transparency of investigation reports will be maintained
Case study is any incident or accident that occurred in Indonesia and the operating airline is registered as an Indonesian commercial airline. This airlines operates a scheduled flight service	To achieve the context of research that analysed the Indonesian commercial air transport system. This research has limited the context to analyse only scheduled flight services.

4.3.2 Spoken Discourse

The written texts were used to develop initial model and there were six open-discussions that were conducted with six experts who were involved in the Indonesian air transport system. Open-discussions aimed at generating thoughts and ideas from people who were involved in air transport related activities. There were no particular criteria used to determine the key persons in order to let the discussions flow naturally. All discussions were conducted while getting permission to obtain data from the NTSC, the Department of Transportation, and Kompas daily newspaper.

4.3.3 Conducting First Field Work

Field work was conducted twice and for different purposes. The first field work, from April to July 2009, aimed to explore issues in the Indonesian air transport system by generating written information.

Prior to the commencement of the field works, permission was needed to obtain that information. Letters were prepared and addressed to the institutions and organizations where the information would be gathered (for example, the Ministry of Transportation, the Department of Airworthiness, Kompas daily newspaper, Gatra Magazine, Tempo Magazine and Angkasa Magazine).

The letters were delivered either by post or email. Some appointments with the proposed sources were agreed to beforehand, but at the time of the commencement of the first field work, some appointments needed to be re-arranged as Indonesia prepared for a Presidential Election.

Reports and publications from government institutions and organizations were generated at the Directorate General of Commercial Aviation (DGCA) and the National Transport Safety Committee (NTSC). Furthermore, publications were generated from one daily newspaper, one aviation magazine and two weekly magazines. A daily newspaper, Kompas, approved access to their database so information was generated directly at the Kompas Information Centre (*Pusat Informasi Kompas*) while the other two weekly magazines (Gatra and Tempo) were accessed online. Later, an aviation magazine, Angkasa, was included as a source of research after direct access to their journalists was approved. In summary, there were 1,438 articles from the media, 63 policies, 36 reports and 174 other related sources (e.g., cartoons, notes) collected[1].

4.4 Data Analysis

Data analysis aimed to reduce the large amount of data collected to a clear, concise and accurate summary. It was conducted following the initial data collection and concurrently with further data collection (Patton, 2002). Therefore, the analysis began with the first field work and continued throughout the course of the research as new sources of information became available. Richards (2005) states that qualitative data are messy records, so they need to be organized to reach a stage of understanding about the context of the research and to prevent the loss of complexity. Therefore, an operational framework was established to guide the analysis, before the details of the analysis were constructed.

4.4.1 Operational Framework

This study started from a phenomenon in the Indonesian air transport system. This phenomenon was the high incident and accident rates (see Section 3.4), which indicated that there were safety deficiencies in the system. Therefore, an initial model was developed to understand how this phenomenon developed. The more information collected, the greater the understanding achieved, which resulted in the development in the findings of this study. The

[1] Some written information was generated during the second field work directly from the interviewees.

understanding was also guided by the theories. The development of this study is shown in Figure 4.1, below.

The first stage of the study was developing the research design. This was constructed from secondary data (e.g., the ICAO reports, the EU's reports, Government press releases) retrieved from the internet and was compared later to the theories to define a gap in the study. In this stage, a research question and two broad assumptions were addressed with the aim of achieving the research objectives. Finally, an initial model was drawn to guide the study.

The second stage expanded the initial model by analysing the data collected from the first field work. The revised model was a factual picture of conditions in the Indonesian air transport system. Laying out this framework clearly exemplified, emphasized and framed the problems that would then be analysed more deeply. At the same time, analysing the collected data resulted in groups that explained this framework in detail. Thus, both findings were determined simultaneously.

The third stage of this study was to confirm, validate and strengthen the findings derived from the previous stage. Then, there was a need to conduct a second field work to investigate the consistency of the findings. Afterwards, the data collected would be analysed and the data collected in the first field work revisited before conclusions were made.

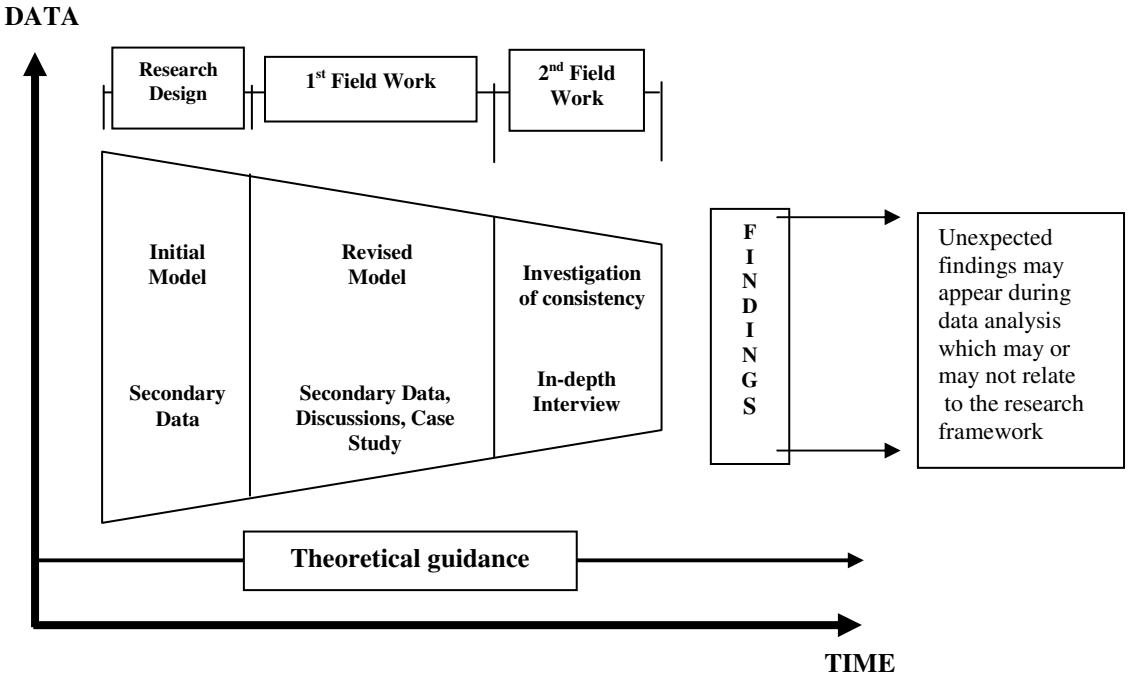

Figure 4.1 The operational processes of data analysis

4.4.2 Managing the Collected Information

The collection of information needed to be treated securely because most was confidential and sensitive and could not be revealed without the approval of the relevant institutions or individuals. In particular for the interviews, any single piece of information gathered during the field work was unique and precious, and could not be recaptured in precisely the same way, even if the opportunity were available again (Patton, 2002). Issues that should be highlighted were the ethical obligation to protect the confidentiality and anonymity of the interviewees (Mason, 1996; Patton, 2002).

Data was stored after sorting to minimize 'thick' irrelevant data and unused information. Clearly setting the context helped to arrange the data which increased following the research flow. Data was grouped as written data and spoken data. Some written data had no digital form so only relevant passages were rewritten in digital form. Spoken information was stored in both audio and transcriptions files.

All soft copies or digital forms were stored in a workstation. Those data had two back-up files, in an individual computer and an external disk. Hard copies or printed forms were kept in secure places where only the researcher had access to them.

4.4.3 Development of the Coding Structure

The coding process was guided by the broad assumptions. Three stages of coding were applied in this research. First, the data collected were read and coded. This stage was used to emerge ideas or thoughts, which seemed related to the broad assumptions, while the data were also sorted, allowing the data to reflect the broad assumptions that were coded. In the second stage, those codes were revisited, including the references, to derive more possible codes that might be defined. This stage was also used to improve understanding about the research based on the data collected. The more data reviewed, the larger the understanding achieved. Finally, the codes were integrated and classified.

The process of coding revealed a complex and multifaceted phenomenon in the Indonesian air transport. Thus, inductive analytic and deductive approaches were needed to make a decision confidently. A broad category was formed by applying an inductive analytic so patterns of ideas were able to be identified; likewise a deductive approach was used to form a sub-category. Hence, integrating and classifying ideas were about judgments. The higher understanding developed from comprehensive analyses, the higher confidence achieved to

make a judgment. This process was conducted continuously until a stage of saturation or new categories and sub-categories were not needed.

4.4.3.1 Coding

A qualitative researcher uses codes to generate new ideas and gather material by topic (Richards, 2005). Qualitative coding occurred throughout the research since the ideas were developed from data until the stage where the researcher perceived they had fully understanding of the phenomena at hand, which allow them to give reasoned and logical explanations (Richards, 2005). Revisiting data from qualitative coding was essential since the understanding and explanation of topics developed over time. It was possible to generate new categories until the last stages of the research. Therefore, coding was about data retention (Richards, 2005) and was carried out iteratively (Le Compte & Schensul, 1999). In addition, coding gave an opportunity for the researcher to introduce a new perspective in interpreting data so it could be compared with other researchers' interpretations.

Coding followed the procedures outlined by Le Compte & Schensul (1999). Coding managed and organised data into categories that were relevant to the research questions. By reading the entire data, important points, ideas or concepts were able to be captured, so sorting and analysing the data ran systematically. Hence, coding made sense of the collected information therefore the themes for analysis can be developed and finally a coherent and interesting narrative was constructed.

There are a number of ways to code based on advice from different scholars. Richards (2005) distinguishes three ways of coding: descriptive, topic and analytical. Descriptive coding involved storing information about the cases being studied. It was not just a process of selecting the text to be interpreted. Topic coding was harder because it involved labelling text according to its subject. This type of coding often employed software that helped to code automatically. But the core to qualitative enquiry was analytical coding (Richards, 2005) applied to achieve theory 'emergence' and theory affirmation.

Mason (1996) views the application of coding in three different ways: literal, interpretive, and reflexive. At the start of the analysis in qualitative research, the researcher may apply literal coding followed by interpreting the coded data. Reflexive coding applied the analysis as an integral part of the data that had been generated. Both Mason (1996) and Richards (2005) defines the process of coding as going from the initial process until the analytical stages emerged and gave a sense to the ideas generated.

Coding can be done either manually or using computer software such as NUDIST and NVivo. In this research, data from the first field work had two forms: printed data and written data in Bahasa Indonesia (the official language of Indonesia). Therefore, the first data collected was coded manually. Manual coding was helpful to reduce and sort the huge amount of printed data and, at the same time, revealed emerging individual themes to understand how the different themes knitted together to form a whole. These important points were rewritten in English (with random reverse translation checks on accuracy). Hence, generating the themes was much easier since all collected document were standardized.

The purpose of this stage of analysis was to ensure that the theoretical ideas emerging in the first round of coding could be systematically supported in the data, thus addressing the validity of research results and this making it 'easier' to see if all data were relevant.

4.4.3.2 Classifying, Integrating Themes and Interpreting Data

Further analysis involved analysing the coded texts and sorting the most relevant data into free nodes. These free nodes were refined, merged, or integrated into tree nodes to describe the inter-relationships between the free nodes contained in each tree nodes. The next stage of analysis allowed the researcher to tell the 'story' and answer the research questions (Le Compte & Schensul, 1999).

Most written texts were in Bahasa Indonesia, including all interviews. To reduce the potential of inaccuracy in translations, ideally, the selected texts or phrases such as quotations would be presented in Bahasa Indonesia but since this research was presented in English, the quotations were in English except for some words or expressions that could not be translated into English. The coding process started quite superficially but, through time, a coding decision was based on knowledge, as the understanding of the topic developed. So, in time, a comprehensive understanding developed the researcher's confidence to make a judgment.

4.4.4 Analysis of Collected Data

Analysing data in qualitative research has no particular template. A discourse researcher, like other qualitative researchers, needs to define their own conventions and work approach. The approaches must assure logical and convincing justifications to 'make sense' of the data, the analysis and, finally, the results.

The phenomena of the Indonesian air transport was investigated by tracing back to determine factors that seemed directly linked to the outcomes (Langley, 2009). Thus, the analysis was

outcome-driven; giving explanations from the outcomes to prior causes to significant events (Aldrich, 2001).

The analysis of the first data collected aimed to develop an understanding how the outcome occurred in the Indonesia air transport system. Two broad assumptions were used as guidance. The data collected were then classified and analysed separately. Findings from each analysis were then triangulated and the results summarised. There were two stages analysis: analyses of the first data collected and the analyses of the second data collected (Figure 4.2).

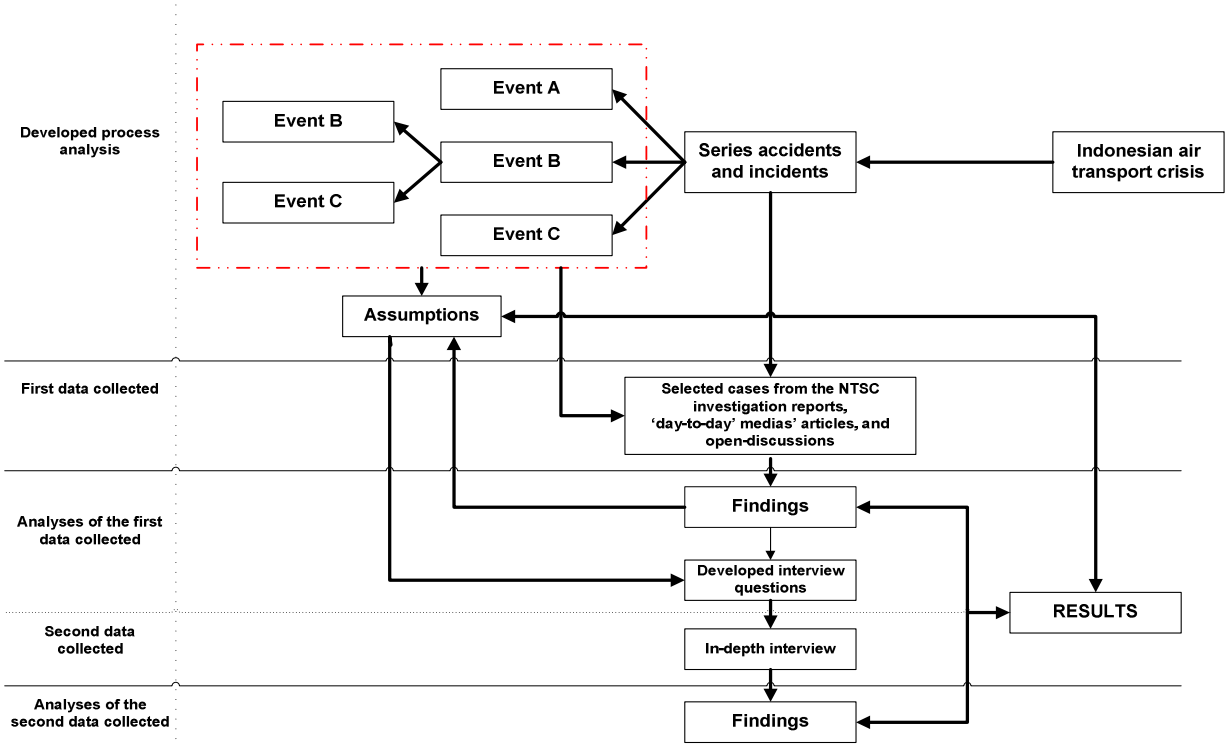

Figure 4.2 Data Analysis Processes

Two types of data were collected from the first field work: written and spoken discourse. Prior to analysis, the data was classified according to Wood & Kroger (2000) as shown in Table 4.4 while Figure 4.3 shows the distribution of the first data collected according the sources. The classification aimed to group the data. The analysis was conducted according the source: media articles, the NTSC's investigations reports and open-discussions. Lastly, the research diaries and notes collected while undertaking the field work were used to retrieve overlooked information.

Table 4.4 Classification of the first data collected (adopted classification of Wood & Kroger, 2000)

Types of discourse data	Source of Data	Situation of data is gathered	Collected Data
Written Discourse	Publications	Gather from the organization's database, provided by the organization online	1438 newspaper and magazine articles 47 reports 14 cartoons
	Unpublished	Day to day thoughts and notes obtained during the field works	Research diaries Notes of field works
Spoken Discourse	Face to face	According to the appointments made with the sources	6 open-discussions

The most data collected were from media articles (93%), followed by reports and regulations/policies (each 3%). Cartoons comprised only 1% of the whole data collected while open-discussions were less than that. The distribution of each source is presented, below (Figure 4.3).

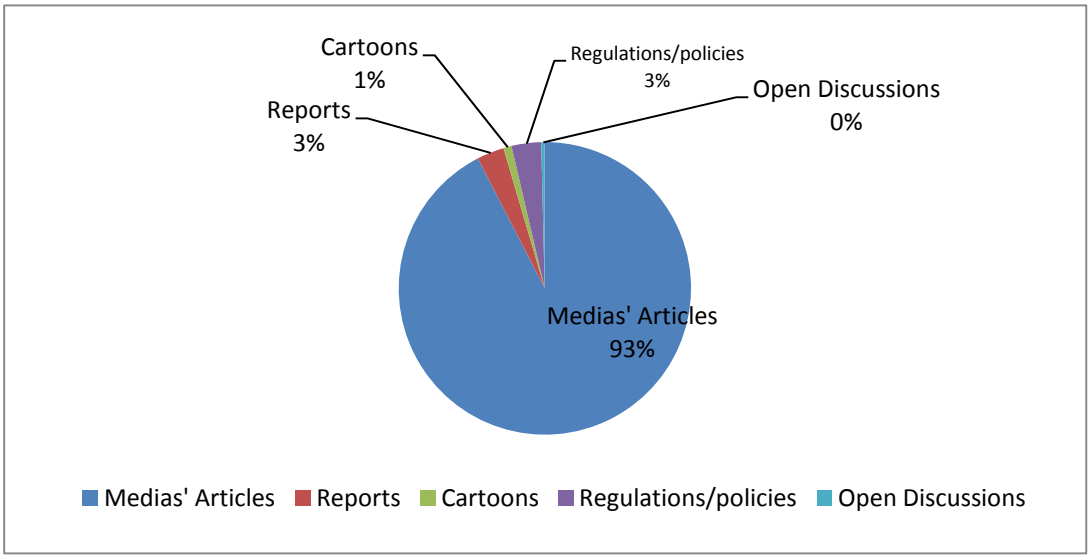

Figure 4.3 The distribution of the first data collected, based on sources

The first data collected were analysed by tracing the outcome back; a framework to analyse the data is shown in Figure 4.4:

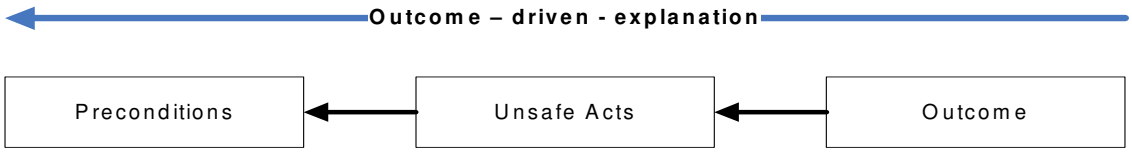

Figure 4.4 Outcome-driven-explanation processes for the research

The data collected were analysed to determine 'how' the processes occurred and 'what' factors caused the process. The data were analysed separately and corroborated with each other to achieve credibility.

The written texts collected from credible organizations and institutions were not only reports but also press releases, announcements and correspondences related to Indonesian aviation. There were 47 written texts analysed. The data were collected mainly from the ICAO, the EU and the Indonesian authorities. In order to maintain the consistency during analysis, the categories developed were similar to the media article classifications.

4.4.4.1 Analysis of the ICAO Audit Reports in 2000 and 2004

Indonesia was audited by the ICAO since 2000 according to the Memorandum of Understanding (MOU) signed on 30 August 2000 between Indonesia and the ICAO. The first audit was the initial audit, from 6 to 15 November 1999, which was referred to Annexes 1, 6 and 8, the Chicago Convention, and related provisions in other Annexes. It also referred to guidance material and relevant safety-related practices in general use in aviation industry. The audit identified shortcomings in the Indonesian air transport system; in particular, there were differences of implementation of aviation-related activities. The CASR Parts 61, 63, 91, 121, 135 and 183 did not comply with the Annexes 1, 6 and 8. For example, there were schools for pilots that were approved although those did not meet the minimum flight training as required by Annex 1 (ICAO, 2001), and CSARs for an accident investigation program only apply to Commuter and Air Charter carriers under Part 135 but no similar requirements may exist for domestic, flag and supplemental carriers (ICAO, 2001).

On 18 January 2001, the Indonesian government submitted an action plan to respond to the initial audit 2004. The action plan was found to be satisfactory, which then was followed by follow-up mission, from 13 to 15 April 2004. This mission identified that the LEI 2000 was 44.27% and it reduced to 10.95% in 2004, which indicated there was a significant improvement in the Indonesian aviation.

However, there were figures that needed to be improved but, in fact, they were not. For example, the number of inspectors was reduced from 32 inspectors in the initial audit 2001 to 12 inspectors in the follow-up audit 2004, the number of technical staff in the DGCA headquarter was reduced from 129 staff in the initial audit 2001 to 116 staff in the follow-up audit in 2004. The ICAO later criticized these figures in the next audit 2007.

The audits clearly captured issues on imbalanced growth of the aviation industry and the number of people who were responsible to handle it. Furthermore, incompetency of officers in the regulatory body, the DGCA, was also highlighted. The ICAO identified there was lack of training provided to officers thus although the officers were capable and qualified, their knowledge were not maintained and improved. Consequently, after sometime, their knowledge was out-of-date compared to the growth of aviation industry. ICAO concluded that these issues rooted from lack of finances. The comparisons of findings of the audits are presented in Table 4.1, below.

Table 4.5 The findings derived from the Initial Audit 2001 and the Follow-up Audit 2004

Activities Audited	The Initial Audit 2001	The Follow-up Audit 2004
Technical staff in headquarter	129	116
Active pilot licenses	3969	4336
Active flight crew licenses	199	200
Active licenses other than pilot and crew	5044	9162
Air transport operators	74	59
AOCs issued	35	59
Aircraft operation inspectors	32	12
Aircraft registered in Indonesia	702	982
C of A issued	520	608
AMOs	32	56
Aircraft maintenance workshop	35	0
Design organizations	1	1
Aircraft manufacturing organizations	1	1
Aircraft type certificate issued	1	1
Aircraft airworthiness inspectors	42	29
Aviation training establishments	0	4

4.4.4.2 The ICAO CSA Audits in 2007 and 2009

Following the expanded concept of the USOAP to the Comprehensive System Approach (CSA), the second audit was conducted from 6 to 15 February 2007. There were 121 findings identified. These findings were related to: primary aviation legislation and civil aviation regulations (LEG), civil aviation organization (ORG), personnel licensing and training (PEL), aircraft operations certification and supervision (OPS), airworthiness of aircraft (AIR), aircraft accident and incident investigation (AIG), air navigation services (ANS) and aerodromes (AGA). The Indonesia's Lack of Safety Implementation (LEI) was 45.88%. The figure was higher than the average LEI of 135 States audited (42.6%). Consequently, the Audit Result Review Board (ARRB) listed Indonesia under 'watch list'.

The highest deficiencies were identified in the CE-4 or Qualification and training of technical staff that reached 80%, which was 19.65% higher than the average LEI of 135 States audited. This figure was followed by deficiencies in primary aviation legislation (CE-1), civil aviation system and safety oversight function (CE-3) and resolution of safety concern (CE-8), which these CEs reached 50% and higher than the average LEI of 135 States audit that 26.16%, 45.02% and 49.02%, respectively.

The main issue identified was incompetency and quantity of people who were responsible for aviation operations. The ICAO highlighted lack of financial support and improper recruitment system as the main reasons of these issues. Improper recruitment system existed as there was no establish mechanism used to attract qualified and competent people to work in aviation related activities in regulatory bodies. Furthermore, insufficient number of training and lack of material or guidance to improve knowledge were identified to contribute to incompetency of people in the system. While there were regulations or policies or procedures needed for operations, but were not existed. Thus, a combination of these factors affected performance people to deal with aviation-related activities.

In response to the audit result, Indonesia submitted a Corrective Action Plan (CAP) on 16 July 2007. The draft was reviewed and resubmitted with some changes and finalised on 1 November 2007. As Indonesia had its CAP to improve the State's aviation safety, the ARRB worked closely to monitor the progress made.

In order to clarify and validate the progress made and reported by the Indonesian authority, the ICAO conducted the validation audit named ICAO Coordinated Validation Mission (ICVM), from 4 to 7 August 2009. The audit found there was a significant improvement of

effective safety implementation according to the CAP submitted. The LEI reduced significantly from 45.88% to 19.64%. The improvement had made Indonesia was recommended to be removed from the ARRB watch list.

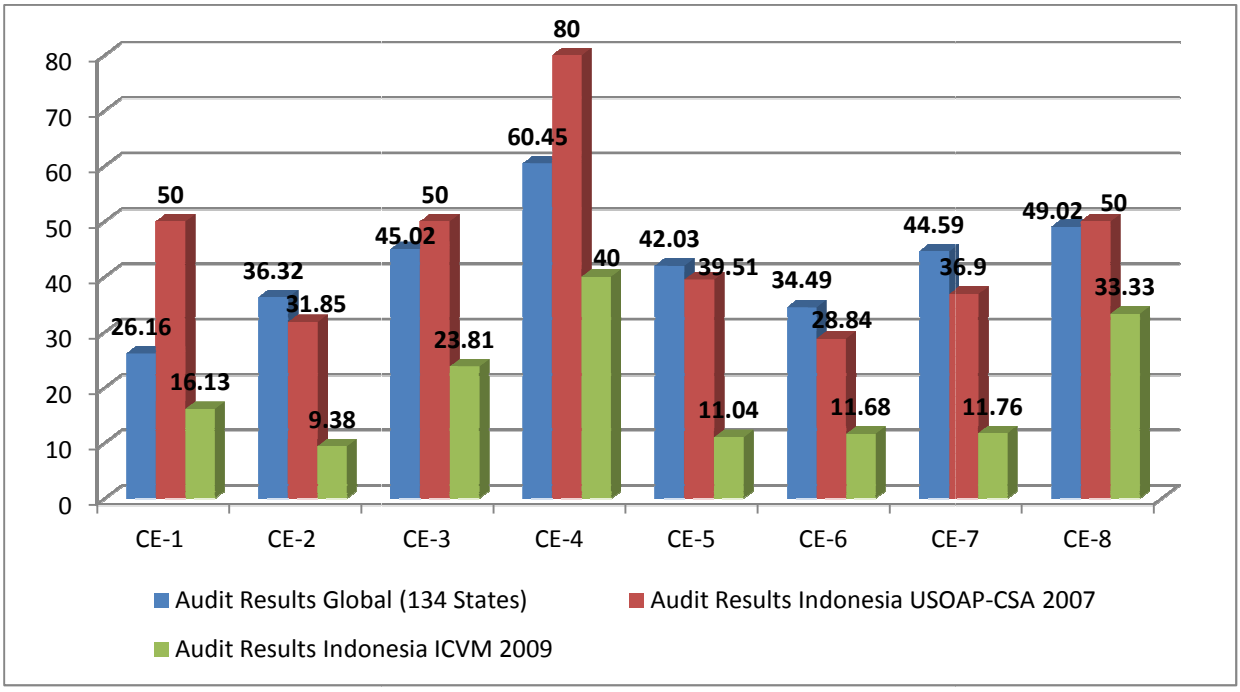

Figure 4.5 Lack of Effective Implementation (%): Global v Indonesia (Source: ICAO, 2010)

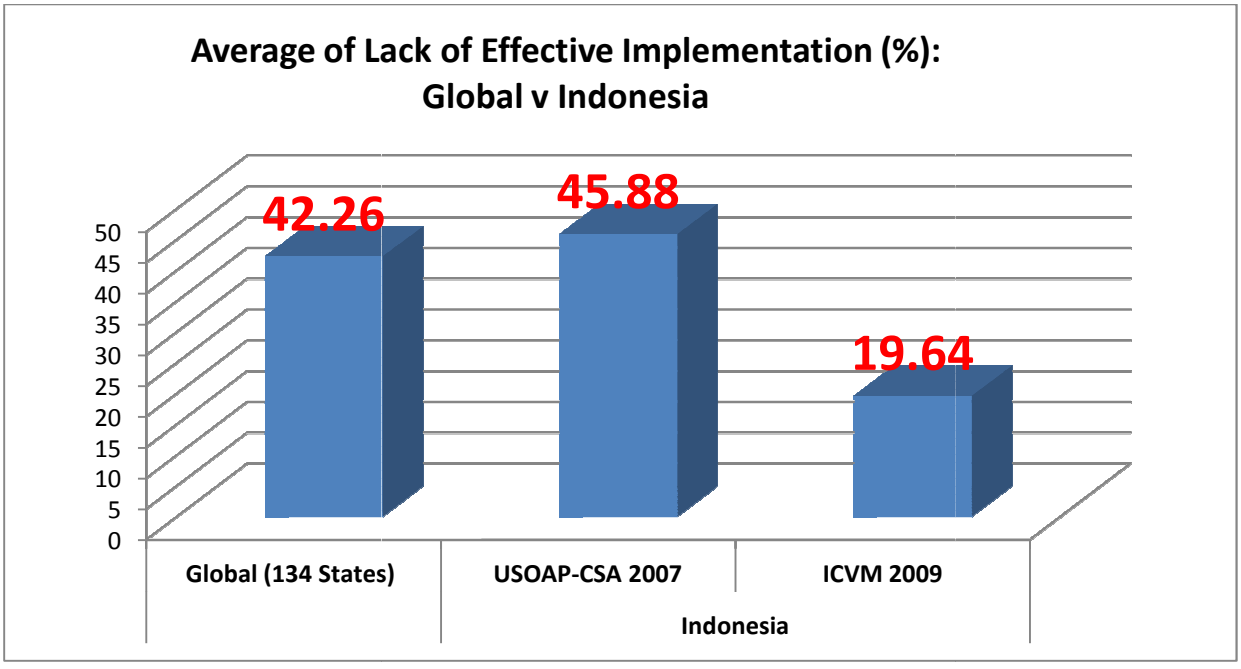

Figure 4.6 Average of Lack of Effective Implementation (%): Global v Indonesia (Source: ICAO, 2010)

4.4.4.3 Analysis of the NTSC investigation reports

Analysis of the NTSC investigation reports aimed to understand 'how 'and 'why' an incident or an accident occurred. Thus, the analyses determined the most probable causes, which would later be linked to factual information (e.g., aircraft information, personnel information) to determine the preconditions. Ten NTSC investigation reports were selected. The logical reasoning for this selection was presented in Section 4.2.1 this chapter.

There were four stages to analysing the reports. First, the reports were read carefully to understand the chronology of the occurrence. There were two incidents, a serious incident, and seven accidents. Four events occurred during landing approaches, four events occurred while taking-off and two events occurred while cruising. One of two cruising events caused a missed landing, and another was a missing flight. In the second stage, how the occurrence happened was examined to determine the most probable causes. Seven reports indicated the cockpit crew committed unsafe acts. One report described a combination of thermal and mechanical failures, and two other reports revealed an instrument dysfunction that led to make decision errors. These most probable causes were listed prior to the next stage of analysis. Third, factual information was examined. The factual information analysed consisted of personnel information, aircraft information, airline information and environmental information (e.g., meteorological information, airport). The factual information was linked to the most probable causes, and so the precondition of the occurrence was determined. The flowchart of the analysis is attached as Appendix C.

Referring to the NTSC investigation reports, there were deficiencies identified that affected the quality of human performances in aviation operation. In the ten cases analysed, there were four cases determined that non-established procedures affected people in operations (e.g., decisions taken by cockpit crew, immediate response of the crew during an accident or incident occurred), while other three cases revealed how the top and middle level management and also regulator did not review and evaluate the existing procedures. Consequently, there were out-of-date procedures and no rules identified in the NTSC investigation reports. For example, out-of-date AEP in the Mandala Airlines MDL 091 case led to poor performance during the accident, which contributed to reduce number of survivors.

In line with the findings revealed in the ICAO USOAP audit report, the NTSC found that poor performance in aviation operations (e.g., wrong decision taken by pilots, lack of

understanding on instruments at the ATC) were caused by deficiencies related to knowledge; for example, less initial or recurrent training provided to cockpit crew. The NTSC investigation found that the cockpit crew had no recurrent training for about five years prior to accident of the Mandala Airlines MDL 493 aircraft. Inadequate training of the pilots led to situational unawareness of the rapid changes of the weather so the PIC took a wrong decision. Consequently, the aircraft was floating and touching-down approximately 1000 meters beyond the target of touch-down point.

All deficiencies implied that there was lack of control to the operational levels. For example, a case of violation to aviation procedures occurred in the Dirgantara Air Service AW 3130 accident when the cockpit crew and the ground handling officers manipulated load manifests. As there was no control from the authorities, the manipulation had been practiced several times prior to the accident. Similarly, the Adam Air DHI 574 missing plane illustrated the lack of control over the recurring IRS defects that reached 154 times. However, the aircraft was allowed to be operated. Consequently the malfunction of the IRS contributed to the accident.

On the basis of ten NTSC investigation reports analysed, there were deficiencies in the Indonesian air transport system identified (see Table 4.6). Although nine cases reported the poor human performances in the operational level as the direct causes of those accidents, these causes were consequences of deficiencies existed in the system. Hence, accidents occurred were not caused by single factors, but there were multiple-causes behind accidents as identified in the NTSC investigation reports.

Table 4.6 Summary of NTSC Investigation Report Analyses

Outcomes	Unsafe Acts	Deficiencies	Safety Recommendations Criticism
Mandala Airlines MDL 493, 5 April 1999	The cockpit crew apparently did not rely on the flight instrument readings, but seemed to trust visual observations of the environmental and weather conditions. They showed a lack of situational awareness because of the rapid changed of the weather. This led the PIC to make the wrong decision	Inadequate training. Unrevised manuals No established rules and procedures Lack of enforcement to comply and implement the rules and procedures.	No recommendations addressed to the DGAC (regulator) that failed to enforce rules. Final report was released on June 2002
Awair QZ 730, 19 October 2000	The pilot was slightly late in reducing the reverse thrust to the idle position. Thus an engine stall occurred and was followed by tail pipe fires on both engines	No established rules and procedures Failure to ensure implementation of rules Inadequate training	All recommendations were addressed to the DGAC and none to the aircraft or airport operators. Final report was released on March 2004.
Dirgantara Air Service AW 3130, 18 November 2000	The PIC had the wrong perception on take-off procedures and the aircraft exceeded its manufacturer's MTOW limits	Fail to control and supervise the aviation activities.	Safety recommendations were not clearly addressed. Final report was released on February 2002.
Garuda Indonesia GA 880, 23 November 2001	The failure mode was a creep-fatigue (thermal and mechanical) combination.	Controlling and supervising was not applied properly by the DGAC (regulator) and the aircraft operator to ensure the procedures were followed.	Safety recommendations were addressed to the DGAC but none to the aircraft operator to ensure proper maintenance were conducted. Final report was released on March 2003

Outcomes	Unsafe Acts	Deficiencies	Safety Recommendations Criticism
Lion Air JT 386, 14 January 2002	There were indications that the cockpit crew failed to execute the take-off checklist while the aural warning CB failed to be detected by the maintenance personnel and this was a contributing factor to the accident	Fail to ensure the implementation of rules while the aircraft operator did not provide adequate training	Safety recommendations were addressed to both the DGAC and the aircraft operator. Final report was released on March 2003
Lion Air JT 787, 31 October 2003	The slippery runway and crosswind caused the aircraft to drift, while the counter action of pilot did not follow the procedure of AOM and failed to bring the aircraft back to the centreline	The unsafe actions taken by the cockpit crew indicated lack of knowledge, which may be rooted in the lack of the operator to provide adequate training for their cockpit crews.	The report mentioned that several cases had occurred at Hassanudin airport previously. But there was no recommendation for conducting a study at the airport. The report is only few pages on and little information was provided.
Mandala Airlines MDL 091, 5 September 2005	The aircraft took-off with improper take-off configuration and this caused the aircraft to fail to lift off. The aircraft's take off warning horn was not heard on the CAM channel of the VCR. It is possible that the take-off configuration warning horn was not sounding	The DGAC did not review and evaluate the operator's AOM/SOP then the operator failed to recognise weaknesses in the AOM/SOP. Additionally, an out of date of AEP had affected performances during an emergency condition. In this case, lack of performance contributed to increase number of victims.	Although there are deficiencies determined in the aircraft operator and the DGAC bodies, furthermore there are also some issues related to deficiencies determined in other bodies, for example the local authority and airport operator. An updated AEP was not established so at the time of accident there was a lack of coordination between those bodies. Referring to the recommendation addressed by the NTSC, none of recommendations were addressed to other bodies except the aircraft operator and the DGAC. The report was released on September 2009

Outcomes	Unsafe Acts	Deficiencies	Safety Recommendations Criticism
Adam Air DHI 782, 11 January 2006	The aircraft's IRS malfunctioned resulting in the IRU providing erroneous and misleading navigation indications. The PIC conducted unapproved tests to the flight attendant trainee so his attention had been diverted to this action. The cockpit crews failed to recognize the deviation of the aircraft from designated point.	Lack of control was revealed in this case. Additionally, the operator did not have sufficient knowledge to understand safety needs by resolving the IRU issues. Lack of knowledge was resulted from inadequate training for operation and maintenance personnel. Inadequate proficiencies to deal with technology were also revealed in this case.	Safety recommendations were addressed to the DGAC and the aircraft operator but none to the airport operator. The report was released on August 2008
Adam Air DHI 574, 1 January 2007	The pilots faced an IRS malfunction. They had inadequate knowledge to solve the problems. Consequently, the aircraft rolled to the right and exceeded 35 degrees right bank. The pilots then became spatially disoriented, finally, the aircraft crashed into the Makassar Strait.	The repetitive defects of the IRS did not lead the DGAC to force the operator to solve the problems. The DGAC also indicated a failure to ensure that the initial and recurrent trainings to maintain and improve the operator crew's knowledge were conducted. The DGAC also did not ensure that the current training programmes met the required standard. The DGAC also failed to do their functions to ensure the quality of the airport operator resources, such as humans and technology.	Different from other NTSC investigation reports, this reports showed the investigation was conducted comprehensively. Thus the recommendations were addressed continuously according to the progress of the investigations. The recommendations were also addressed to the Ministry of Transportation to review related law that comply with the ICAO Annex 13. Moreover, the recommendations were also addressed to other aircraft operators to ensure their aircrafts did not have the same IRS malfunction. The report was released on August 2008

Outcomes	Unsafe Acts	Deficiencies	Safety Recommendations Criticism
Garuda Indonesia GA 200 on 7 March 2007	The aircraft was flown at an excessively high airspeed and steep descent during the approach and landing, resulting in an un-stabilized approach. The PIC did not follow company procedures that required him to go around when the approach was not stabilised. The co-pilot also failed to follow the company procedures to take control over the aircraft when he saw the PIC ignored the procedures. Additionally, the condition of the airport did not meet the ICAO standard also contributed to accident	The operator should develop a safety culture environment, which may be needed to enforce the rules. The airport operator failed to follow the rules, moreover, they had inadequate knowledge to establish an immediate response system to implement if there is an occurrence and had a lack of control for ensuring readiness to handle an occurrence	Similar with the Adam Air investigation report, the NTSC showed the investigation was conducted comprehensively. Thus the recommendations were addressed continuously according to the progress of the investigations. Report was released on August 2008

4.4.4.4 Analysis of media articles

In contrast to the NTSC investigation reports, analysing media articles took longer time because there were 1438 newspaper and magazine articles as well as 11 cartoons. The articles were grouped by publisher. A descriptive coding was applied to determine information related to ten NTSC investigation reports. In this stage, any information related to the cases were coded and stored. The second stage coded any data that was not related to the cases, but related to aviation activities. These coded data were then labelled according to the group; for example, the most probable causes of accidents or incidents (e.g., pilot actions during an accident or incident, mechanical defects, *colonimbus* cloud), the government's and stakeholders' reactions (e.g., speech after an event, instruction for evacuation), regulations or policies (e.g., issuance of a regulation, implementation of a policy).

The ICAO audit reports revealed deficiencies in the Indonesian air transport system. The reports provided comprehensive analysis, but the analysis was mainly at the regulatory level. In contrast, the NTSC investigation reports identified shortcomings not only at the regulatory level but also at the operational levels. However, the NTSC investigation reports only revealed any issue related to accidents, which the investigation conducted according to Annex 13. Thus, those reports could not provide clear pictures of other aspects in the Indonesian air transport system; for example, reactions of people (e.g., managerial level, regulatory level) when an accident occurred.

Here, the media articles reported some factors that were not identified by other reports. Following the DGCA audit to all Indonesian airlines, Kompas and Gatra reported that there were deficiencies related to knowledge revealed. For example, airlines cut operational costs by reducing number of training in order to survive in the condensed aviation market such Indonesia. Similarly, Angkasa magazine also stated there were insufficient numbers of training provided by airlines and even there was an airline that manipulated numbers of training provided, which involved people in regulatory level.

However, manipulation was not the only threat identified. Several articles in Kompas newspapers reported that there were bribery and collusion practices in the Indonesian aviation. These factors were practiced from the operational level to the regulatory level such as bribe to speed up licensing approval or collusion to win a tender of procurement goods.

Here, the deficiencies and threats worked together to affect performances in the system. Additionally, socio-cultural aspects were identified from the articles collected; for example, a

co-pilot was *sungkan* (it means in certain way: shy) to remind the pilot when this pilot made a mistake even though the co-pilot knew he put passengers and the aircraft in danger. Here, the co-pilot reflected his non-assertive behaviour that was often found in the aviation operations in Indonesia. Cultural aspects were also identified when an accident occurred. People tended to accept an accident as bad luck instead of a failure of a system that possible to be avoided. These examples illustrated influences of culture to affect performances and perceptions of people in the system.

Media articles also highlighted reactions of people after an accident or incident occurred. The political of blame was there after an occurrence. Pilot errors were often pointed out as causes of an accident or incident by the top level management that, sometimes, was supported by a statement from the regulator. The media articles also reported the lack of willingness of the regulator to enhance safety, which showed from the lack of sanctions given to the operators.

Hence, the media articles revealed that there were socio-political factors influences in the Indonesian air transport system.

A. Corroboration of findings derived from the first data collected

The data collected were corroborated with each other in order to achieve a degree of validity and reliability of finding derived from the first data collected therefore final findings were determined. The process, concurrently, developed the broad conceptual framework that would be explained in details in Section 4.4. The summary of the written data analysis is shown in Table 4.7, below.

Table 4.7 Summary of Document Analyses

No	Critical Elements	Sources (No of References)	Findings	Conclusion
1	**Legislations and Regulations**			
	The ICAO examined ten primary legislations: a. The Act No.15/1992 on aviation, b. Government Regulation No.3/2001 on security and air transport safety for civil aviation, c. Government Regulation No.70/2001 on airports, d. Minister of Communication Decree No.1/2004 on civil aviation safety regulations, e. Presidential Decree No.9/2005 on organizational unit and duty echelon I of the DGCA, f. Presidential Decree No.10/2005 on job function and description of government organization of the Republic of Indonesia,	ICAO USOAP 2007 (7) Newspaper articles (27) Magazine articles (18) NTSC investigation reports (8) Other documents (21)	Availability and accessibility of the primary legislations and regulations were limited. Only few legislations and regulations that could be accessed at the DGCA website but those were only available in Bahasa Indonesia.	Limited access to the legislations and regulations resulted in lack of reference or guidance to operate the air transport system. Here, the regulator was indicated fail to socialize the legislations and regulations.
		ICAO USOAP 2007 (6) Newspaper articles (13) Magazine articles (9) NTSC investigation reports (5) EC No.787/2007 (1) Other documents (7)	Unclear regulatory framework to form and shape the authority of the DGCA to enforce the relevant safety standard in aviation. The primary legislations and regulations also did not provide procedures for enforcing the air transport operations, for example; suspension, revocation and exemption.	The unclear function and authority of the DGCA had resulted in lack of enforcement. Here, the DGCA had not been clearly authorised to impose a sanction or punishment to any action against safety standard that may cause unsafe operation.
		ICAO USOAP 2007 (8) Newspaper articles (19) Magazine articles (38) NTSC investigation	The primary legislations and regulations did not comprehensively regulate all aspects in air transport.	Un-established legislations and regulations resulted in lack of reference or guidance to operate the air transport system.

	g. Presidential Decree No.62/2005 on organization and functions of the Ministry of Transport, h. Presidential Decree No. 105/1999 on establishment of the NTSC, i. Government Regulation No.3/2001 on the establishment of an independent investigation agency, the NTSC j. Ministerial Order KM 43/2005 on organization and administration of the Ministry of Transport, the DGCA. The ICAO also examined twenty three CASRs. In contrast, the European Commission used the ICAO USOAP 2007 and the FAA IASA 2007 as reference for its decision to apply the operating ban to all Indonesian certified airlines. Prof. Saefullah Wiradipradja criticised the Act No.15/1992 and Government Regulation No.40/1995	reports (21) Critics from Prof. Saefullah Wiradipradja in 25th years of PT. Dirgantara Indonesia (2001) Other documents (18)		
		ICAO USOAP 2007 (4) Newspaper articles (8) Magazine articles (17) NTSC investigation reports (16) Critics from Prof. Saefullah Wiradipradja in 25th years of PT. Dirgantara Indonesia (2001) Other documents (11)	The primary legislations and regulations did not comply with the international standard (e.g. ICAO SARPs, ICAO Annexes). The legislations and regulations did not amend and ratify according to the international standard.	Non compliance with the international standard indicated the primary legislations and regulations had not been reviewed, revised and harmonised with the international standard thus any amendment could not be done.
		ICAO USOAP 2007 (57) Newspaper articles (36) Magazine articles (41) NTSC investigation reports (23) Other documents (17)	The policies, procedures and rules under the primary legislations and regulations were not established. Although there were few policies, procedures and rules established, they were not comprehensively enough to guide aviation operations. Additionally, the existing policies, procedures and rules were often not be distributed and disseminated in effective and efficient manner.	Un-established and incomprehensible rules, policies and procedures resulted in lack of reference or guidance to operate the air transport related tasks.

2	**Resources**			
	Human Resources (recruitment system and required qualification)	ICAO USOAP 2007 (10) Newspaper articles (28) Magazine articles (31) NTSC investigation reports (6) Other documents (9)	There was no mechanism to recruit qualified and competent human resources while the DGCA was not involved in the recruitment.	There was no standard of recruitment thus the persons recruited possibly did not meet national or international standard to fill the positions in aviation operations.
	Maintaining and improving knowledge through training and providing related material	ICAO USOAP 2007 (16) Newspaper articles (31) Magazine articles (21) NTSC investigation reports (36) Other documents (6)	There were no established continuous programmes to maintain and improve the human resources through training and also providing related materials.	Un-established and discontinued training programmes to maintain and improve knowledge resulted in the poor performances of the humans to conduct their aviation related tasks.
	A shortage of humans, funds, facilities and technologies	ICAO USOAP 2007 (29) Newspaper articles (25) Magazine articles (39) NTSC investigation reports (15) Other documents (11)	There were a combination of shortages human, funds, facilities and technologies identified.	The shortages interconnected with other deficiencies; for example, lack of training, improper facilities.
3	**Threats in the system**			
	Manipulation	Newspaper articles (17)	These threats were ‘sensitive’ to be	These threats were not only in aviation

		Magazine articles (26) Other documents (14)	discussed freely. Only after the reformation era in 1998, media wrote and published articles about these threats.	sectors, but also in other sectors. In aviation industry, these threats were appeared in all levels, from the regulatory level down to the operational level.
	Bribery	Newspaper articles (21) Magazine articles (19) Other documents (11)		
	Collusion	Newspaper articles (14) Magazine articles (12) Other documents (6)		
4	**The causes of aircraft accidents and incidents**			
	Human contributions	Newspaper articles (36) Magazine articles (15)	These causes founded as the causes of aircraft accidents and incidents in the Indonesian air transport system. Some of the codes founded interrelated with Section 3, Resources.	These causes were usually pointed after an accident or incident occurs, even before an investigation is conducted as reported in media.
	Weather	Newspaper articles (14) Magazine articles (17)		

4.5 Revised Model

The findings derived from the first data collected above were used to develop the initial model. There were two categories of findings identified: deficiencies in the Indonesian air transport system and barriers to learning. These categories were related to research questions and assumptions developed in the beginning of this study.

The revised model (Figure 4.7) improved the understanding on the Indonesian air transport system. However, the revised model could not precisely represent relationship between threats and the barriers in the Indonesian air transport system. Therefore, although these factors had been identified, there was a need to conduct and determine *how* their relations in the framework developed. Consequently, the second field work needed to be conducted and aimed at not only further investigating the findings derived from the first data collected, but also to promote further understanding of the revised model.

4.5.1 Findings Derived from the First Field Work Study

The first data collected was clearly shown there were 'deficiencies' in the quality of resources either at the operational level (e.g., maintenance activities, flight operations) or in the regulatory level (e.g., establishing rules, controlling implementation of rules). The deficiencies were not only technical matters (knowledge, rules and enforcement) but also socio-cultural factors (manipulation, bribery and collusion). Additionally, the political aspect was also identified

In accordance with the first data collected, the deficiencies identified in the Indonesian air transport system were categorised as follow:

1. Deficiencies on quality of human resources referring to personnel competencies and capabilities to handle their duties; for example, lack of training provided either at regulatory level or operational levels, insufficient number of inspectors;

2. Deficiencies on regulation/policies/procedures in aviation operations referring to regulation/policies/procedures used in aviation operations that were not complying with and consistent to international standards; for example, out-of-date CASRs, no Airport Emergency Plan (AEP) and no Airport Manual (AP);

3. Deficiencies on technologies and facilities available to support aviation operations referring to inappropriate technologies and facilities needed for aviation operations; for

example, design and operation of aerodromes that were not complying with the ICAO Annex 14 amendments; and,

4. Deficiencies on organizational and management resources referring to any safety regulatory functions, objectives and safety policies. The organizational and management included all aviation-related authorities, which might be established as separate entities (e.g., airport authorities, meteorological authorities). Examples of deficiencies in this category were: Indonesia had no regional or local offices of the DGCA to regulate aviation operations thus the only headquarter office that regulated Indonesian aviation with more than 17,000 islands. The line of cooperation between the DGCA and the SAR was unclear and seemed to be overlapping.

Additionally, the performances were also influenced by 'threats' that existed as a result of interactions among people in the system. Three threats were identified:

1. ***Manipulation*** refers to achieving a purpose by making unfair or artful changes; for example, manipulated number of passengers or cargo loaded into an aircraft, manipulated number of trainings provided for pilots and crew;

2. ***Bribery*** refers to the bestowing of a benefit in order to unduly influence of action or decision; for example, paying some amount of money for getting an Air Operator Certificate (AOC), giving money and providing facilities to inspectors during their inspections; and,

3. ***Collusion*** refers to secret agreement or cooperation which benefits a particular party; for example, direct appointment of procurement of an aircraft that is supposed to follow bidding processes.

The last term determined from the first data collected was 'failure to learn' as indicated by the high accident and incident rate. The data collected revealed inconsistency of regulator to implement aviation-related legislation and regulation to regulate aviation-related operations. The ICAO stated that Indonesian aviation authorities were absence to provide comprehensive and coordinated approach to implement corrective actions needed in a systematic and consistent manner. Similarly, the EU also found the authorities shortcomings to regulate and enforce safety in aviation activities, which was supported by the media articles that reported the lack of commitment and willingness of the authorities to enhance safety. In addition, political system of the country was identified to be another barrier to learning.

1. ***Lack of commitment and willingness*** to take consistent actions to enhance safety in aviation operations. This barrier was revealed at the regulatory level and operational levels. The regulator tended to react only if there were media, public and international pressures. However, the actions were only temporary to answer the concerns without any systematic and consistent approaches. Similarly, as the pressures from the regulator, media and public loosened, operators seemed to be released and returned to their past approaches; for examples, in cases of Adam Air that the regulator took actions 'Aircraft on Ground' (AOG) only after there were pressures from media and public. In fact, an accident and few incidents prior to the AdamAir missing-plane case were not making the regulator to take an action to conduct inspections to all airlines; and

2. ***The political system*** was another barrier identified. Indonesia is a democratic country, and has been ever since the reformation 1998 experiment with multiple-parties. Officials often have two or more overlapping responsibilities, as well as social and professional commitments, across supposedly independent branches of the government; this can lead to difficulties in various areas. For example, the regulator identified has insufficient budget for improving aviation as the regulator (who is also executive) has to submit its budget proposal to the legislator who will approve the budget, including the budget for aviation activities (e.g., budget for investigators to conduct their investigation activities, budget for socialising regulations). The approval of the budget was often depending on lobbying rather than its importance or urgency. This kind of practices also occurred when taking a decision; for example, the AOG's decision to select people to be placed on the regulatory level (e.g., Minister of Transportation and his Directors).

These barriers manifested influence people and erect barriers to learning from the past experiences, which were determined to exist in the Indonesian air transport system according to the first data collected.

The findings derived from the first data collected above were used to develop the broad conceptual framework. There were two categories of findings identified: deficiencies in the Indonesian air transport system and barriers to learning. These categories were related to research questions and assumptions developed in the beginning of this study. Thus, a summary of the research questions, the assumptions and the findings was used to develop the broad conceptual framework.

Table 4.8 Relation of research questions, assumptions and findings derived from the first data collected

Research Questions	Assumptions	Findings[2]
What is the origin of the Indonesian aircraft accidents and incidents?	There is a deteriorating process in the Indonesian air transport system. 1. There is a deterioration process before an accident occurs (Reason, 1990, 1997; Toft & Reynolds, 1997; Turner & Pidgeon, 1997) 2. There are accumulated, unnoticed failures in pre-conditions (Pauchant & Mitroff, 1992; Shrivastava, Mitroff, Miller, & Miclani, 1988; Turner & Pidgeon, 1997)	There were deficiencies in the Indonesian air transport system that could be grouped as deficiencies related to: 1. Human resources who design and operate the system, 2. Regulations/rules/procedures available to regulate aviation operations, 3. Technology and facilities available to support aviation operations, and 4. Organizational and management resources
How did accidents and incidents keep occurring in the Indonesian air transport system?	A series of accidents and incidents indicate failure to learn 1. Recurrences of the events indicate failures in learning from previous events (Pidgeon & O'Leary, 2000; Sagan, 1993; Toft & Reynolds, 1997)	Commitment and willingness of either regulator or operators were found as barriers to learn from the past. Politics was also identified play a significant role in learning after an event

Referring to Table 4.8, there were deficiencies related to: human resources, regulation or procedures, technologies and facilities to support aviation operations and organization and management resources. The first data collected identified not only deficiencies but also threats that worked together to lower performances in aviation operations so, sooner or later, led to an occurrence (accident or incident).

The second assumption was related to a series of accidents and incidents in the system, which indicated failure to learn. Here, the first data collected identified that there was failure to learn, which was caused by: lack of commitment and willingness to enhance safety and the political system. These were determined as barriers to learn from the past experiences.

[2] This was a summary of findings. The analysis was in Section 6.3.

Thus, the findings above were used to develop the broad conceptual framework. The revised model (Figure 4.7) was emphasized in this study and improved the understanding of the Indonesian air transport system. However, the conceptual framework developed was unable to precisely figure out *how* the relations of the threats and the barriers in the Indonesian air transport system work. Therefore, although these factors had been identified, there was a need to conduct and determine more closely their relation to the framework developed.

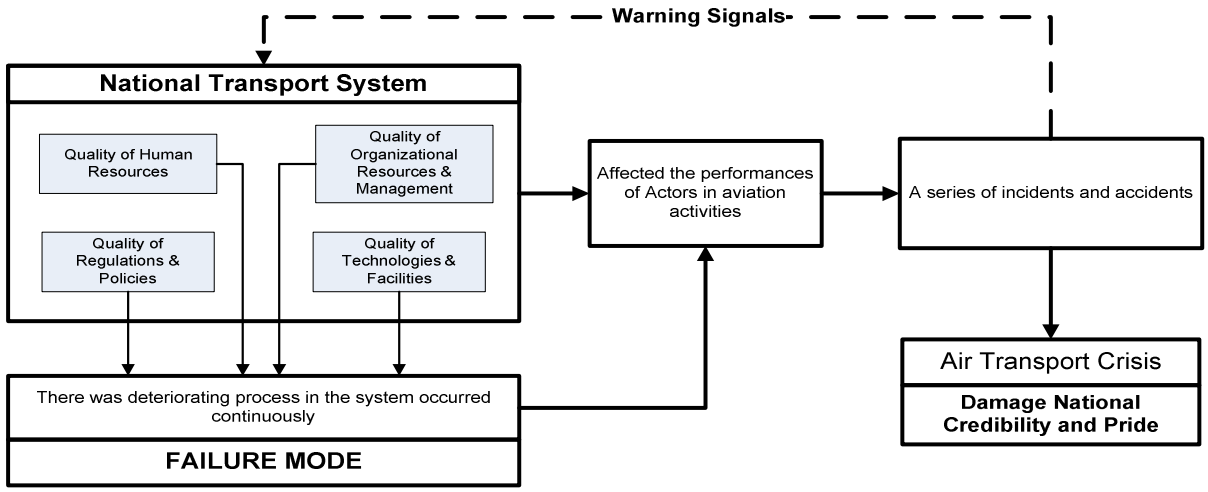

Figure 4.7 The Revised Model

4.5.2 Elaborating Assumptions

Referring to the findings and the revised model, assumptions about the Indonesian air transport system were developed too. The assumptions were: the operating ban applied by the EU was only a consequence of the deteriorating processes in the Indonesian air transport system; and a series of precipitating events (accidents and incidents) indicated failures in learning. These broad assumptions were elaborated into four assumptions (Figure 4.8) that were then used to develop the questions for the second field work.

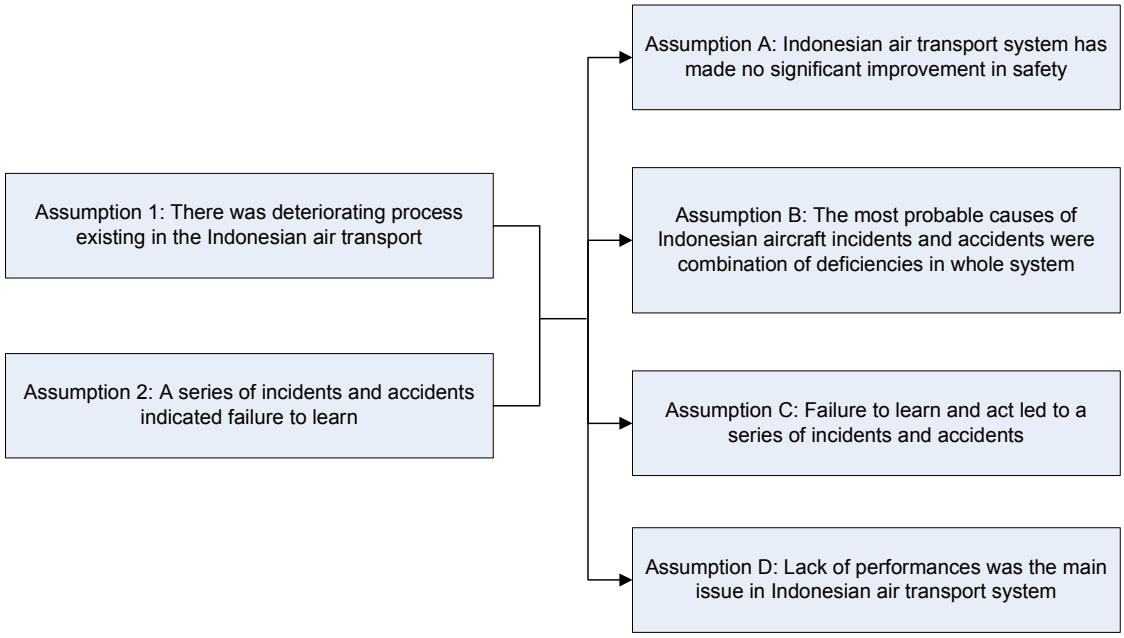

Figure 4.8 The Assumptions Elaborated

4.5.3 Constructing the Interview Questions

In line with the development of the broad conceptual framework and elaboration of the main assumptions of this study, there was a need to investigate the consistency of the findings derived from the first data collected. Furthermore, there were unclear relationships between the deficiencies, the threats and the barriers identified in the first data collected. Thus, prior to conducting the second fieldwork, four questions were, therefore, constructed according to the elaborated assumptions, as shown in Table 4.9, below.

Table 4.9 Constructing the interview questions

Assumptions	Guiding Questions for interview
Assumption A: Indonesian air transport has made no significant improvement in safety	Tell me about the current state of Indonesian aviation safety?
Assumption B: The most probable causes of Indonesian aircraft incidents and accidents are combinations of deficiencies in the whole system	In your opinion what are the most probable causes behind these incidents and accidents?
Assumption C: Failure in learn and act led to a series of incidents and accidents	In your opinion, why have so many incidents and accidents occurred in the past 10 years?
Assumption D: Lack of performances is the main issue in Indonesian air transport system	Currently, what are the main issues in Indonesian aviation?

4.6 Summary

This research investigated the Indonesian air transport system to understand *how* and *why* accidents and incidents were socially constructed. The complexities and dynamic changes of the system cannot be understood only from a single perspective. Thus, the adoption of the qualitative approach to this study allowed exploration of holistic representation of reality through written texts and listening research participants expressing their perspectives on the social reality of the Indonesian air transport system. The adoption of a process study approach, based around discourse analysis, enabled this study to deal with time and history so it provided an explanation of how aircraft incidents and accidents were constructed in the Indonesian air transport system.

Chapter 5
Second Field Study

5.1 Introduction

This chapter illustrates the second field work. There are five sections in this chapter. Section 5.2 explains the method used to generate data in the second field work. Section 5.3 describes the second field work data analysis. Section 5.4 presents the results derived from the second field work and, finally, Section 5.5 concludes and summarises this chapter.

5.2 Generating Data

Spoken information was generated by conducting open-ended interviews with key informants. An interview meant having a conversation to obtain information pertinent to the research questions, between the researcher and the research participants (Minichiello, Timewell, & Alexander, 1990). Here, open-ended interviews were conducted to capture information from the interviewees by letting them express their perspectives freely and bring in their thoughts that were seen as important to them. In addition, the use of language which was familiar to the interviewees would reveal more information.

5.2.1 Conducting Second Field Work

The second field work, from February to March 2010, aimed to investigate the consistency of the findings derived from the first field work.

The second field work aimed to gather spoken information by conducting open-ended interviews with key informants. The key informants and the open-ended questions were determined after analysing the written information. The interview protocol consisted of a brief introduction to the study, an abstract and a statement of the anonymity and confidentially of the interview. The protocol aimed to solicit the interviewees' views on all Indonesian aviation accidents and, in particular, the organizational influences that led the accidents to happen. Therefore, information from the interviewees' perception about the study was achieved.

5.2.1.1 Key Informants

In this study, three factors were used to determine the key informants: their potential knowledge and apparent involvement in Indonesian aviation, availability and costs required in visiting

them. The intent in using range of interviewees was to capture differences and enrich the research. Consequently, six groups of key informants were identified: Operator Officers, Line Management, Investigators, Regulators, Parliamentarians and Observers.

The method used to develop the research questions was described in Section 4.5.3

Table 5.1 Significance of the research questions

Research Topics	Logical Reasoning
1. Current state of Indonesian air transport safety	**To assess the interviewees general knowledge and understanding about Indonesian aircraft accidents issues**
2. The most probable causes of Indonesian aircraft accidents	**To determine the causal factors in Indonesian aircraft accidents**
3. Issues related to the high rate of aircraft accidents in the past 10 years (1999 – 2008)	**To assess the interviewees' perception of causal factors in the past 10 years**
4. Issues in Indonesian aviation that needed to be improved	**To capture the interviewees' perceptions of any issues related to aviation safety in Indonesia**

5.2.1.2 Interview Approaches

Prior to the commencement of the second field work, personal communication with key informants was developed. In order to help the participants prepare, an interview protocol was sent to them prior to the interviews. At the commencement of the field work, SMS (Short Message Service) was employed to arrange an appointment with the interviewees. SMS is commonly used and culturally acceptable in Indonesia, even to communicate with government officers and VIPs (Very Important Persons). Approaching key informants using phone calls would be less effective since a call from an unknown or unlisted number would be ignored.

A challenge in this field work was to develop 'trust' with the key informants. Accordingly, informal conversation was introduced at the beginning of the conversation. Trust was very important since talking frankly about the Indonesian air transport system, particularly aircraft accidents, would lead to some sensitive issues such as corruption, collusion and politics. Moreover, anonymity and confidentially should be stated clearly to eliminate worries about revealing 'sensitive' information. After a brief explanation, all interviewees were asked if they

had any questions about the interview. The interviewees were also asked their permission to record the interview; only sixteen interviewees permitted this out of forty-six interviewees.

The interviews were conducted without knowing how many interviews would be useful prior to speaking with the interviewees. According to Strauss and Corbin (1998), the more interviewees, observations and documents obtained by a researcher, the more variations of the important aspects will be obtained and that process will provide a greater data density.

In this research, snowball sampling was used as an approach. At the end of an interview, the interviewee was asked to recommend other individuals to participate in the study. This technique was effective and helpful since the aviation world was a kind of 'closed' community and recommendations were essential to get access into the community.

Most interviews took about one to two hours, sometimes longer. Although the interview protocol was available, the sequence of questions asked depended on consideration of what was most relevant to the interviewees because the interviewees were most comfortable talking about something with which they were familiar. The interviewees' answers were listened to carefully so the flow of conversation could be directed to the research questions. With the exception of some government officers, most of the interviewees were interviewed individually.

In the beginning, no more than two interviews were scheduled for a day. Since most interviewees were VIPs, the schedules were dependent on their availability. In total, there were 46 participants interviewed. The interviewees represented six top level officers in the government department, 11 academics, 19 practitioners and 10 academics who were also practitioners. They had all worked in aviation for more than 15 years, except for two interviewees.

5.2.2 Summary of Key Informants

There were 46 of interviewees in this research. A summary of the interviewees is described, below:

1. Experiences in the aviation activities
    a. All interviewees had more than 15 years experience in the aviation activities except for two who only have 14 years and 12 years experience in the aviation activities. Therefore, the interviewees have been involved with the Indonesian air transport activities during the time frame of the research, from 1999 to 2007.

b. Thirty two interviewees had more than 20 years experience in aviation activities while 12 interviews have 15 – 20 years experience in aviation activities. The other two interviewees had fewer than 15 years experience in aviation activities.

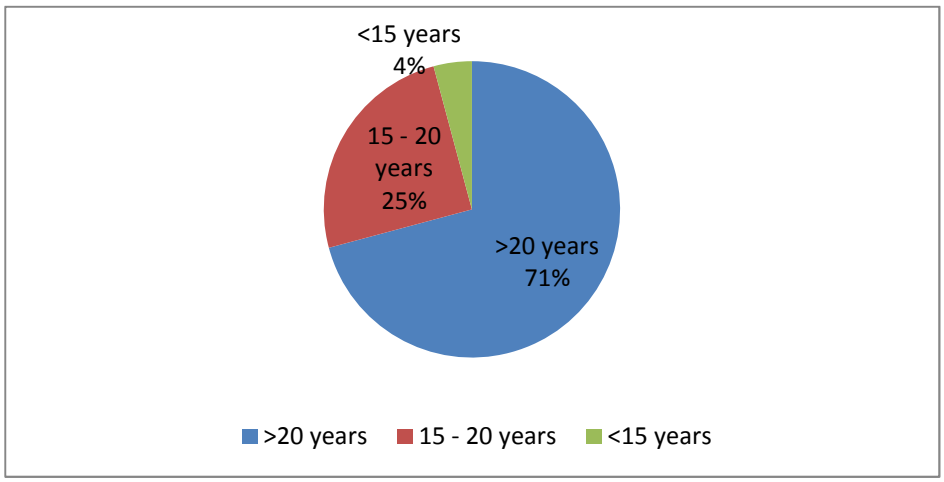

Figure 5.1 The distribution of interviews based on experience in aviation activities

2. Job tasks

a. Six interviewees were government officers in the top level who were responsible for making decisions in their departments.

b. Eleven interviewees were academics who had good knowledge about the Indonesian air transport system since sometimes the government asked for their expertise as consultants or key note speakers.

c. Nineteen interviewees were practitioners who had good knowledge about the Indonesian air transport system. The practitioners came from different departments in aviation operations, such as pilots, mechanics and CEOs.

d. Ten interviewees were academics who were also practitioners. All interviewees had experience as practitioners before they engaged in academic activities.

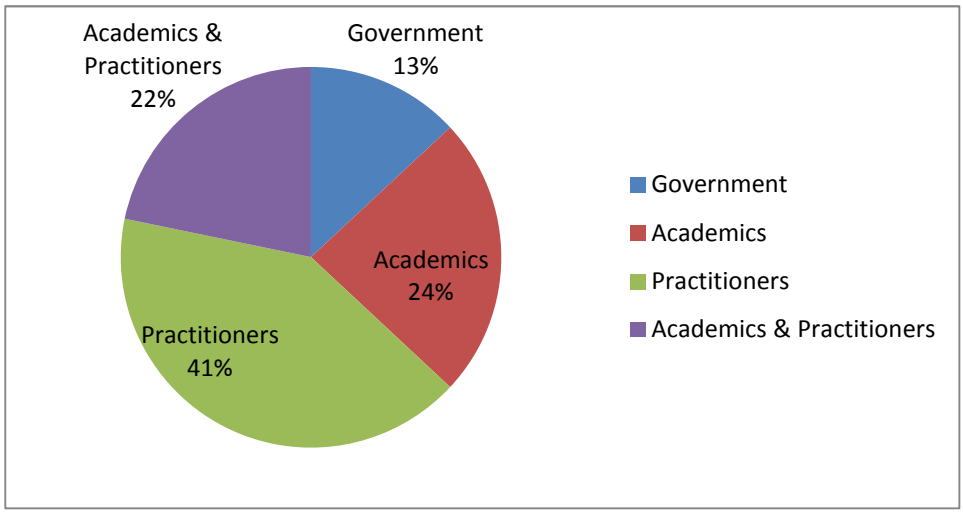

Figure 5.2 The distribution of interviews based on job tasks

All recorded interview data were read carefully and crosschecked with fieldwork diaries to identify if there was any information that might be overlooked. It has to be noted that there were only sixten interviewees agreed to be recorded, therefore thirty interviewees disagreed to be recorded so the whole information gathered during the interview sections were written in fieldwork diaries. Thus, to avoid and minimize misinterpretation or missing information, the interviewees were asked to listen and confirm all information that were written by researcher.

5.2.3 Acknowledging the Interview Bias

In order to achieve a degree of flexibility and openness while conducting an interview, there are other issues that may possibly emerge as well. Openness may result in data containing expressions of feelings and sentiments about issues unrelated to the research questions. This may result in a lack of coherence and comparability across a range of interviews. However, the short notice given to the interviewees may have led their responses to be about current issues and information rather than past historical events. Thus, with the intention of reducing bias, a research protocol was established and delivered prior to the interview while questions were used to guide the flow of the interview.

5.3 Data Analysis

5.3.1 Transcribing

Once interviews were conducted, there was a need to reproduce the spoken words in written text. This process is called transcription or transcribing (Halcomb & Davidson, 2006). Transcribing transforms the recorded interview but, at the same time, analyses it. This task constituted a different level of analysis. This research conducted in-depth interviews and

required ‘in-depth’ listening to the recorded interviews, which gave an opportunity to do a deep analysis.

There may have been some information overlooked during the interview, so transcription helped to reduce and sort important and relevant information about the research questions. The rest of the information could then be removed (e.g., personal information).

In order to eliminate loss and misinterpretation of the information from an interview, transcription and analysis of the information was carried out on the same day unless the interviews were completed late at night. A summary of the day’s interviews was noted, which contained difficult encounters and the ‘environmental’ situation during the interview to retain the ‘sense and nuance’ of the interview. These summaries served as the data for this study.

5.3.2 Coding

The second stage of analysing the interview data was initial coding or coded any data that researcher thought relevant to the Indonesian air transport system as, sometimes, there were sections of the interviews that out of context. Coding processes were similar to the first field study (see Section 4.4.3.1).

5.3.3 Classifying, Integrating Themes and Interpreting Data

The third stage was integrating and classifying the data coded from the second stage to categories. There are three main perceived categories, from the strongest to the weakest, as indicated by a number of the interviewees; they were enforcement-based deficiencies, rule-based deficiencies and knowledge-based deficiencies.

There were ten deficiencies determined, from strongest to weakest, as follows: no control (13), out-of-date rules (9), inadequate knowledge (7), lack of sanction (6), non-compliance with international rules (5), inadequate training (4), no guidance (4), infirmness or irresoluteness (4), not the right persons in the right jobs (3) and unclear rules (3). Furthermore, the quality of the system identified had been affected by three threats: manipulation (28), bribery (24) and collusion (12).

The quality of resources led to changes in performance at the operational level. The interviewees agreed (89%) that there was a lack of performance in the Indonesian air transport system. Only 7% of the interviewees disagreed while the other 4% did not answer the question. There were two factors identified that affected performance. These main perceived categories were indicated by a number of interviewees, they were perceptions (40) and safety culture (15).

This chapter also presents that the interviewees' opinion who asserted the Indonesian air transport system made no significant improvement in safety. Before the operating ban, all interviewees agreed that there was no significant improvement in aviation safety. But after the operating ban, there were eight interviewees (17%) who agreed there were improvements while the other 38 interviewees (83%) disagreed. Four factors were identified as barriers to improved aviation safety, from strongest to weakest, as follow: commitment and willingness (33), just to fulfil requirements (24), political system (2) and covering issues (18).

Furthermore, 36 interviewees agreed that failure to learn was a cause of a series of accidents and incidents in the Indonesian air transport system. Five interviewees disagreed while another five did not answer the question. As the series of accidents and incidents indicated vulnerability of the system, the interviews revealed three causes of vulnerability of the system: regulator (61), existing system (53) and operators (25).

5.3.4 Ensuring Rigour and Validity

Although qualitative research has the potential to produce rich data, it has limitations. It cannot be precisely replicated since it is specific to a time and place (Read, 2005). Accordingly, the quality assurance methods used in quantitative approaches (assuring, validity, reliability, generalizability and objectivity) as stated by Lincoln and Guba (1985), are inappropriate to qualitative approaches.

Objectivity and rigour are issues in this research because of the subjective perspectives of the researcher (e.g., designing study and analysing data collected) and participants (e.g., expressing their perspectives) which will bias the findings. Enhancing the rigour of this study is achieved by assuring its credibility while objectivity is improved through conformability (Lincoln & Guba, 1985). Additionally, Yin (2003) stated that various sources of evidence were used in order to validate and strengthen the final results. Thus, the strategies to achieve credibility and conformability in this study are: clear reporting of the development of the study, develop criteria used to obtain data (e.g., written texts, selection of participants), audit trials (e.g., writing fieldworks' diaries, recording the interviews) and the provision of multiple sources of evidence (triangulation). Although there were important for considering the level of importance information, there is also a need to consider number of sources to validate information. This study was considered both factors, importance of information and number of sources to support the information.

5.4 Results

5.4.1 Actors in the Indonesian Air Transport System

On the basis of the interview data, there were significant contributions of people in the Indonesian air transport system to cause accidents and incidents in the system. This was highlighted by the interviewees, particularly in the context of the regulatory body. They perceived that improvements in the Indonesian air transport system would be possible if the regulator improved the quality of their human performances, before improving other sectors such as technology and facilities. Examples of their specific statements are presented, below. The names in this study were pseudonyms to assure anonymity of the interviewees.

> *"[The] quality of human resources is the issue in our aviation system. I highlight the regulator's resources, which are not good enough. The regulator should improve their officers' knowledge, provide comprehensive regulations and apply strict enforcement. Additionally, the regulator should provide adequate infrastructures for aviation operations. As long as the regulator does not improve the quality of their resources then it is impossible that sustainable aviation safety will be achieved."* (Madi, an academic)

> *"[We] need to improve the quality of resources. The improvements should be applied to humans, regulations, technology and facilities. The most important is the regulator. They should improve their quality before improving the quality of the whole system. There are many issues in the regulator body, such as inadequate knowledge [and] poor mentality. Therefore, internal reformation should be applied inside the regulator body. A good regulator will establish a good system."* (Arga, an academic)

Harun, who has been working as a government officer at the Department of Transportation more than 15 years up to the present and is one of the decision makers in the Department, agreed.

> *"The quality and quantity of resources, especially people, are issues that should be prioritised to be solved."* (Harun, a government officer)

This study identified how the quality of some actors was precisely contributing significantly to accidents or incidents in Indonesia.

The interviews revealed how human deviations appeared throughout the whole system, from the operational level to the management level and even at the regulatory body. Likewise, human errors were often blamed as a cause of an aircraft accident or incident along with the weather. An example is:

> *"Human [errors] and weather are the easiest factors to point out. Humans [pilots] are easiest to blame because mostly the pilots were killed in the Indonesian aircraft accidents. Weather is also easy to blame since it cannot defend itself,..ha..ha... Although we all know how sophisticated weather technology is nowadays, here, in Indonesia, it is different, weather is used as an excuse."* (Dian, a CEO of an airline)

While another interviewee mentioned that:

> *"I like it when the regulator gave a statement after an accident or incident because I like to guess which one will be blamed, human errors or weather. Ha..ha..ha.."* (Wira, an aircraft engineer)

Human errors and weather were the most common factors to be blamed if there was an accident or incident. Pilots often were killed in any fatal accidents in Indonesia while weather, of course, was unable to defend itself for being blamed; for example, as stated by Agi and Odi, below.

> *"[The cause of Indonesian aircraft accidents and incidents are] Human error because it is easy to blame while at most of accidents, the pilots were killed. For example, in Adam Air DHI 574, how an aircraft could get lost from radar [MAATS]; it was impossible but it happened. Then all blames went to the pilots. Who knows whether the pilots realised the IRS problems before flying but they cannot refuse to fly for some reasons such as the management forced them to fly. When I checked the condition of MAATS, there was an indication of corruption in operational costs. The case was similar to Adam Air – Tambolaka case."* (Agi, a public analyst)

> *"They [regulator] said the most probable causes were [always] human errors and weather. These[factors] were really easy to be blamed. Here, human errors meant pilot errors. Once an accident occurs, then the pilot often is a first person to be blamed. This is similar to weather; it is easy to be blamed.. The funny thing in this country is a conclusion was there although an investigation was not conducted yet. Thus, public opinions had been developed to accuse someone or something as the cause of an accident."* (Odi, an investigator and academic)

However, the percentage of weather issues in the interviews data was not high, only being mentioned by five interviewees. In contrast, weather issues were found in three out of ten of the NTSC investigations reports, while these issues were also revealed as a cause of accidents and incidents according to the written documents (see Table 4.6 and 4.7). Since this study focused on the organizational factors therefore the external threat, in this case natural causes, was not analysed in detail.

The interview data revealed that the quality of people was the main issue in the Indonesian air transport system. Deficiencies of the system were resulted from the quality of humans in the system and these were used to develop the categories of the study. The categories developed were associated with the establishment processes of the system. Thus, there were three categories identified: *enforcement-based* deficiencies, *knowledge-based* deficiencies and *rule-*

based deficiencies. There were ten deficiencies determined. Figure 5.3 presents the distribution of each category while Figure 5.4 presents the frequency of each factor as determined from the interviews.

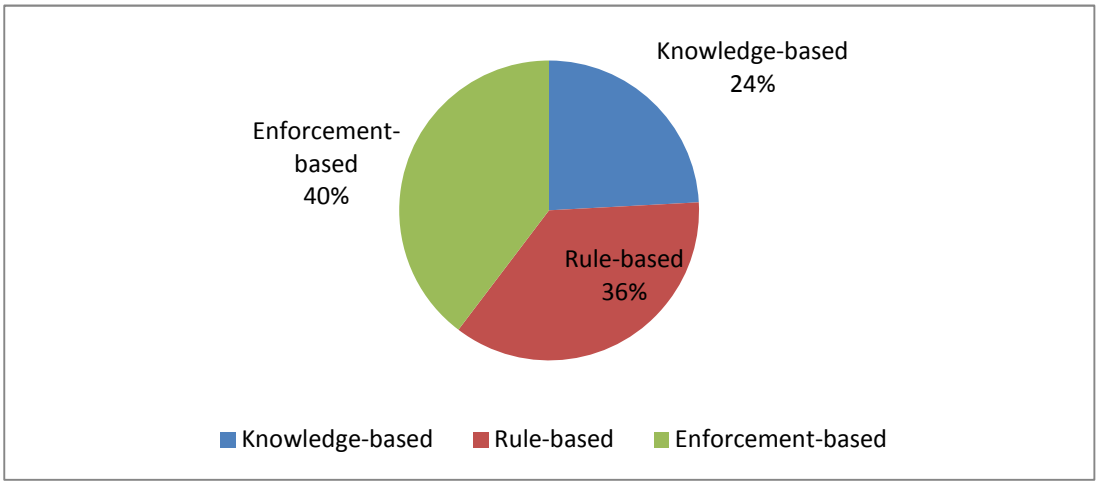

Figure 5.3 The causes of the aircraft accidents and incidents in the Indonesian air transport system

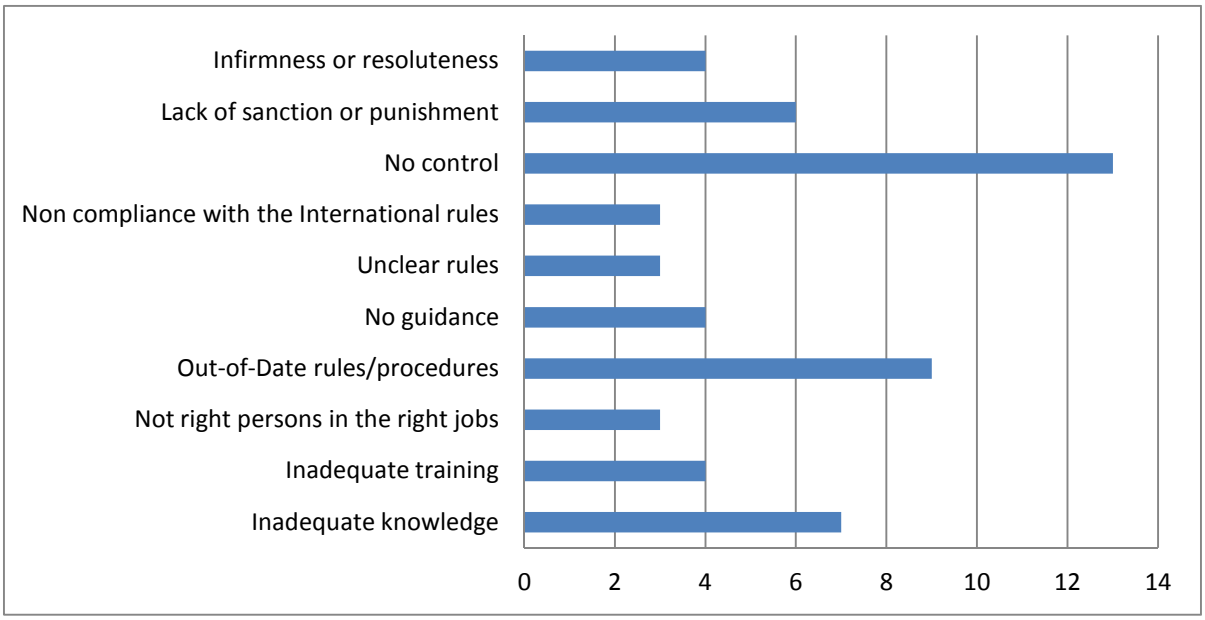

Figure 5.4 Deficiencies in the Indonesian air transport system

In analysing the deficiency factors above (Figure 5.4), some were related to human's capabilities and abilities that were emphasized by the interviewees. For example:

> *"We need to distinguish between human error and human factors. Human error is a term used to describe deviations in human performances; for example, ones had to do A, but he did B because he committed error. Human factors are complex because those refer to anything where people are involved. People are limited by their mental model that is developed by education, experience, environment, values, belief, et*

cetera. So, I conclude that human error means deviations in ones performance; human factors refer to ones' limitation of something, either thinking or acting." (Arga, an academic)

"Human error is any unexpected, unplanned and unwanted action of human. But, human factors refers to a study of how those errors occurred." (Hani, a CEO of an airline)

"Human error is defined as human's deviation while human factors are used to explain that deviation." (Harun, a government officer)

These deficiency factors will be presented according to its category, below.

5.4.1.1 Enforcement-based Deficiencies

"There are lack of controlling, supervising, and monitoring to ensure any aviation activities follow aviation rules and procedures. The regulator does not have sufficient numbers of officers to conduct the tasks." (Hanung, an academic)

As Figure 5.3 and 5.4 show, there were deficiencies related to enforcement. This was indicated by the highest percentage of interviewees who asserted these types of deficiencies (40%). There were three deficiencies revealed: no control (13), lack of sanction (6) and infirmness or irresoluteness (4).

The interviewees clearly identified a' lack of control' in the aviation operation. They used two cases of the AdamAir fleets as examples. The AdamAir DHI 574 case showed that there was lack of control of the DGAC over the operator, Adam Air, caused the airline to keep using the IRS (Inertial Reference System) that had 154 recurring defects. Likewise, prior to the AdamAir DHI 574 accident, a similar case had occurred in another AdamAir fleet, DHI 782. The aircraft used an IRS that had 18 recurring defects and led to a serious incident.

"The AdamAir DHI 574 case is a really good example for showing a lack of enforcement. I blame the DGAC for this case since they failed to control the operator, AdamAir Sky Connection, to replace their IRS that had 154 recurring defects." (Agi, a public analyst)

"In the AdamAir DHI 574 case, the regulator had to be responsible because the DGAC failed to control the use of the IRS that had 154 recurring defects. The DGAC knew there was a similar case, AdamAir DHI 782, had 18 recurring defects. So, the DGAC should control all fleets, but they did not." (Arga, an academic)

These cases showed regulatory ineffectiveness in ensuring the IRS defects had been resolved. In-depth conversations emphasized the interviewees' views on the lack of control. They underlined reasons behind this deficiency; for example, there was a combination of shortage of

resources and supervision, either at the regulator or operators. Windra (an air maintenance officer) explained how the lack of control occurred in operational activities.

> "*It is absolute ignorance, operators often did not control their officers thus they did not know if there were unsafe actions that might lead to an accident or incident. For example, maintenance works often did not being controlled, although there were log forms [reports]. Thus, if a maintenance person did not fix a screw properly, nobody knew since he did not write any report in the log. So, supervision is essential to ensure the tasks are done in the right manners."*

Specifically, an interviewee asserted the shortage of resources in the system.

> *"Since the regulator has a shortage of resource, they just choose the case that is most seen by public and media."* (Kardi, a pilot)

Anto (a consultant and academic) suspected cost-efficiency was another reason behinds the shortage of resources.

> *"The regulator had shortage of inspectors to supervise operators so the operators were easily to commit unsafe acts, which were mainly caused by economic reasons, for instance to cut operating costs for efficiency."*

To some extent, interviews linked enforcement with development of safety culture. Darun (a government officer) addressed the importance of enforcement to develop safety culture.

> *"I agree if knowledge and rules are root causes of the problems in Indonesian aviation, but don't forget, enforcement is another essential factor; it is needed to establish a sense of safety until safety becomes a habit and, finally, a culture. At that time, enforcement is not needed any more."*

Besides underscoring the lack of control, the interviewees expressed their observations regarding the regulator's attitude. The AdamAir DHI 782 case was used to illustrate the fact that there was no sanction or punishment imposed on the aircraft operator, AdamAir Sky Connection, concerning the recurring defects of the IRS prior to the serious incident that indicated the AdamAir management ignored the issue. Similarly, AdamAir DHI 574 accident had similar IRS problems. That aircraft is still missing today. One of the causes of accidents was the IRS malfunctions.

> *"There was no sanction been given by the DGAC over the AdamAir Sky Connection even though there were recurring IRS defects founded in the AdamAir DHI 782. The DGAC was careless because if they just let go [failure or mistake] without punishments then a fatal event occur. In fact, it did. The AdamAir DHI 782 is missing until today at the Makassar Strait, and the aircraft had even 154 recurring IRS defects [prior to accident]."* (Arga, an academic)

> *"There was no sanction to the AdamAir [DHI 782] that diverted from its original destination [Makassar] to Tambolaka Airport. The NTSC revealed there were IRS recurring malfunctions. Thus, the serious incident was only a consequence of the IRS problems and the management decision that kept using the dysfunction IRS."* (Madi, an academic)

Another attitude that was highlighted by a few interviewees was that it is 'easy to forgive and forget'. This attitude could be the possible reason of why the regulator did not enforce any mistake or failure in the system.

> *"Forgiving and forgetting is a weakness of our regulator. If there was a mistake, often it passed without any explanation. Then, it would be forgotten. Consequently, the similar mistakes will reoccur in the future. That was happened in our country."* (Dian, a CEO of an airline)

An interviewee stated that this attitude should not be applied in aviation since it is a high-hazard environment organization.

> *"To forgive and forget is a good manner but it cannot be applied to aviation activities. The regulator should remember, aviation is a high-hazard environment, so it should be regulated and controlled properly to minimize any kinds of risks. Fail to prepare, prepare to fail."* (Odi, an investigator and academic)

Undeniably, there were sanctions or punishments applied by the regulator but the interviewees underscored that such actions were often applied after pressures from the public and media:

> *"The regulator often neglected any cases until media and the public voiced their concerns. Let's take the Adam Air case as an example. The regulator grounded the airline only after the public and media forced them to do that even though accidents and incidents that involved Adam Air fleet kept occurring."* (Yoga, a consultant and academic)

> *"Let see the Adam Air DHI-574 case, only after the media and public forced the regulator [to take actions] then the DGAC grounded the airline and the Garuda Indonesia GA 200 alike."* (Agam, an academic)

Delaying actions caused a cynical comment from Dani (the CEO of an airline):

> *"That is Indonesia. If there is no enforcement from either within or outside the country, then the regulator will not take any action."*

Indeed, delaying actions reflected an apparent resolve of the regulator not to respond toward any issue in the aviation operation. Low integrity of officers to do their tasks in the regulatory body was suspected by the interviewees as the explanation of the regulator's infirmity. For example, Beno, a government officer, described that he did just fulfil his tasks but did not care

what his tasks are about. He did even not care if what he was doing would affect safety, as long as he was able to satisfy his 'boss'[3]. Securing his job was most important. Beno said that he just thought of his family when he had to approve a license of pilots or aircrafts; if he loses his job then he cannot finance his family anymore although he knew that sometimes pilots did not take initial tests or aircrafts could not pass some inspections, such as C and D Checks. He worried that he would get caught one day, but he also knew that the enforcement was not strict, and that some rules were not easily comprehended, allowing different interpretations. Such issues would doubtless help later if he was caught.

> *"Honestly, I only did my job. I don't care much about other things, I only don't want to argue with my Boss. I only think about my family since it is not easy to find a job recently. I know that, sometimes, I did unsafe actions or even break the rules but I have no choice."*

Muli, a government officer, agreed that while some individuals did this practice, he respected individuals like Beno who had no choice since it was not easy to get a job in Indonesia. The bureaucratic system gave opportunities for these kinds of practices while simultaneously allowing persons with power (authority) to abuse their power for gaining benefits for themselves or others. In contrast, he, who has worked in the Department since 1988, blamed the legal system. He mentioned that incomprehensible rules and the lack of enforcement of the existing rules were the reasons for the deficiencies.

> *"How did deviations happen? It is nothing more than legal system; it does not work. No control, no sanctions. The rules and regulations have never been reviewed while they also can be multi-interpreted."*

This study revealed that the regulator inability to enforce regulations was most likely due the lack of integrity or responsibility of the officers while economic and political drivers were used to justify their actions.

5.4.1.2 Rule-based Deficiencies

> *"Our regulations or rules are not continuously reviewed and updated thus we never know whether the regulations or rules are still appropriate to be used in the current situation. The vast growth of aviation sectors is not followed with the development of resources, in particular, the rules or regulations. Thus, through the time, these regulations or rules are unable to guide the aviation activities."* (Yoga, a consultant and academic)

[3] Boss is a term used by interviewees to reflect how a bureaucracy system works. A few interviewees described working environment in the regulatory body as a 'don't ask, just do it' environment thus the word 'boss' also implies their unhappiness with their Head of division or department.

The data collected suggested that there were rules that were no longer appropriate to the current condition. There had been no review to determine whether revision was needed or not. Thus, if there was a need to update the rule, it was not done. The interviewees asserted the Act No.15/1992 that many actions have not been appropriate to regulate the Indonesian air transport system.

> *"It had been 15 years since the Act [No.15 year 1992 on aviation] was issued; it had never been reviewed, no amendment. The Government Decree No.40/1995 aimed to give a comprehensive explanation on aviation since all verses in the Act were not clear enough but it was not better afterwards. Academics suggested to review or even substitute with a new regulation as mentioned by Prof. Wiradipradja; but, again, it was not done. Then the EU issued an operating ban while the ICAO criticised Indonesian primary legislations. Everybody began to be concerned,....ck..ck..ck.."* (Hanung, an academic)

> *"The Act was inapplicable to current situation; although often academics and practitioners proposed some changes, the regulator seemed to ignore the feedback."* (Hani, a CEO of an airline)

Furthermore, discontinued improvements of rules were also asserted by the interviewees. They clearly stated that the growth of aviation was not followed by the improvements of rules. There were no reviews to update the existing regulation. Thus, the operational levels also were not able to update their policies since there were no changes to the regulations. Examples of specific statements were:

> *"No changes. Our regulator was too busy with other problems to review the appropriateness of a regulation. Sadly, this attitude affects the operational level, the airlines could not update their operational rules since the higher level that used to guide were not updated."* (Aman, a Chief operational of an airline)

> *"Regulations are the framework of activities. They are like navigators; they guide and lead. They are also used as benchmarks. Hence, we can imagine how our aviation regulations are unable to do their functions anymore. The system has no benchmark and guidance until,.....BOOM! Accidents and incidents occurred."* (Karman, a journalist).

Yadi, an operational manager of an airline, explained how unrevised rules contributed to the Mandala Airlines MDL 091 that killed 100 people on board and 49 on the ground, while other 41 people had serious injuries. The Airport Emergency Plan (AEP) was determined as a factor contributing to reduce the number of survivors. The AEP had never been revised, updated and even practised. Therefore, at the time of accident, AEP could not be applied appropriately and that led to a lack of coordination in handling the situation.

> *"Why there were many people killed in the Mandala Airlines PK-RIM accident? That was because the emergency response from the airport was too slow. The AEP [Airport Emergency Procedures] was unrevised and, the worst, it had not been practised for long times."*

Similarly, a few interviewees asserted that the AEP remained unrevised prior to the Garuda Indonesia GA 200 accident at Adi Sucipto airport, Yogyakarta, which killed 21 people. The unrevised AEP was found to hinder emergency actions. The interviewees asserted that the company policy only used the AEP for getting license approval and, through time, the policy was not reviewed so the policies became out-of-date.

> *"The airport officers responsible in an emergency failed to conduct immediate response during the occurrence. The KNKT [NTSC] investigation revealed a non-reviewed AEP as a reason."* (Budi, a pilot).

> *"This is another trick of an airline. They fulfil all requirements for getting license approval, including company's procedures and rules. But, through the time, these procedures or rules had never been reviewed until something wrong happened."* (Harun, a regulator officer)

Beside out-of-date rules, another issue related to rules was that there were rules that did not comply with the international rules. The interviewees, especially academics, underscored this issue:

> *"Air transport is the most regulated transport mode since it is standardised internationally. But, Indonesian regulations and rules often did not comply with international rules."* (Agam, an academic)

> *"Our standard of practices often did not comply with the ICAO standards [SARPs and CASRs]. For example, at the Garuda Indonesia accident in Yogyakarta; after years the NTSC revealed that the airport did not meet the ICAO Annex."* (Odi, an investigator and academic)

In line with compliance of rules with international standards, there was another issue raised. A few interviewees recognised some regulations were adapted from another country but two interviewees disagreed that the regulations were adapted. They perceived that the regulator had 'copied and pasted' or 'cloned' other states' regulations instead of adapting.

> *"I do not agree with the word adapt, for me, Indonesia is cloning other States regulations. The worst is the regulations were copied directly and translated to Bahasa Indonesia without having a study whether the regulation suits or not to Indonesia."* (Hani, A CEO of an airline)

> *"No,..no..! We don't adapt the international rules but copy paste them [the international rules]."* (Banu, a retired pilot and academic)

Besides criticising the existing regulations, the interviewees also emphasised that there were inadequate rules and regulations. Two pilots, Kardi and Budi, shared their experiences taking

decisions without any reference while Banu specifically explained how no reference could easily lead to a dangerous situation. Their statements were:

> *"Sometimes we have to take a decision without any reference, but if the execution fails, then anyone will blame us."* (Kardi, a pilot)

> *"Flying without a reference? Ha..ha..ha..it is not a new issue. I have a few experiences."* (Budi, a pilot)

> *"I was a pilot for 40 years and met this issue many times, particularly, at a new born or small airline. Ignoring this issue will lead to an accident because in a critical situation, the cockpit crew, needs a reference before taking a decision. If there is no reference, the cockpit crew will decide according to their knowledge but often intuition. Taking a quick right decision in a critical situation without reference is not an easy job, it may easily place passengers and aircrafts in a dangerous situation that possible to lead to an accident."* (Banu, a retired pilot and academic)

However, inadequate rules were not only common in aircraft operation, but also identified in Air Traffic Control (ATC), for instance, in the Adam Air DHI 782 accident. The aircraft was scheduled to land at the Hassanudin Airport, Makassar but diverted to Tambolaka Airport, East Nusa Tenggara, which is over a sea. The NTSC investigation revealed that there was no Standard Operational Procedures (SOPs) for the Makassar Advance Air Transport Service (MAATS). Beni agreed with the NTSC report.

> *"We found there was no SOPs for MAATS as stated in the [NTSC] investigation report."* (Beni, an investigator)

Conversely, there were conditions in which existing rules were not clearly defined and this may have led to confusions or misinterpretations. Some interviewees agreed.

> *"I am a practitioner. I agree that aviation regulations were not clear enough. If the primary regulations were not comprehensive, which is I believe as a cause of unclearness, so the regulator should issue regulations that are aimed to provide comprehensive explanations."* (Ani, a CEO of an airline)

> *"Our legislation, the Act No.15 year 1992, was not comprehensive while the lower regulations, such as the Government Decree No.40/1995, were also unclear and had multi-interpretations. The regulator said that there was nothing wrong with our legislations and practitioners said it too. But I do not agree."* (Aman, a Chief operational of an airline)

Moreover, unclear rules will affect performances in the operational level, as stated by Anas.

> *"The officers, sometimes, did not know what to do because their job tasks were not clearly defined."* (Anas, an academic)

Kris (an academic) mentioned that the regulator and the legislator began to concern and pay more attention after the EU applied the operating ban to Indonesia. The new legislation, the Act no.1/2009, has, finally, been approved by the legislator after more than 10 years. But, he saw other problems after the new Act was issued, it was not well communicated. Subsequently, many officers, airliners, or users did not know it well.

> *"Prior to the EU's operating ban, none of legislator or regulator paid attention to our legislations. Although many academics proposed the regulator to review existing legislation, the regulator always said that there was nothing wrong with those regulations. The problem arose was only deviation in implementation"*

In agreeing with Kris's statement, Sukri admitted that communication programmes for regulations were not well-established in Indonesia, particularly in aviation industry. As a senior journalist, he often received invitations to attend events (e.g., seminars, discussions) that aimed to communicate new regulations or rules:

> *"These events [communication of new regulations] were often held in luxury places such as four or five star hotels, holiday cottages, or high-class restaurants, where the attendees were journalists, practitioners, some academics and the government officers. These events often became social events rather than formal events. The portions of time for eating or social talking were more than for discussions for the regulations. These practices have been done this way for years, and I did not see significant improvements about aviation regulations as a result."*

Similarly, Bima (an academic) stated:

> *"How can the regulations and rules be well communicated since the communication programme hosted just to waste money. Then, the regulator will invite media to blow up the events."*

Sukri was not the only interviewee who criticised communication events. Burhan (a regulatory officer) agreed with the ineffectiveness of the programmes.

> *"I support my department to communicate the regulations by inviting journalists, practitioners, and others, because I know they, especially the journalists, will expose that in the news. But I disagree with the programme delivery. There were department's facilities that could be utilised but they [the department officers] did not want to use these facilities. They preferred to host the events by wasting money in luxury and prestigious places. It was unethical. Doing these practices just to show that the department did something, I really feel ashamed as a regulator officer."*

In sum, there are four deficiencies related to rules: out-of-date rules, no guidance, unclear rules and non-compliance with the international rules. These deficiencies drive an individual into two scenarios: performing correctly or incorrectly. Bad rules might lead to correct violation or non-compliance, while no rules could lead an individual to correctly improvise, but also possibly to

make a mistake. The data collected revealed that many humans in the Indonesian air transport system performed erroneously.

5.4.1.3 Knowledge-based Deficiencies

> *"What system? Recruitment? Oh come on. We have no standard and mechanism to recruit qualified and competent officers."* (Ludi, an aviation analyst)

According to the interviews data, there were deficiencies related to knowledge. Three types of deficiencies were identified: inadequate knowledge, inadequate training and not the right person in the right job. The interviewees clearly stated that there were the existences of insufficient knowledge of people to conduct their task in aviation-related activities that may occur for various reasons, which also reflected the knowledge gained before the personnel started their job. For example, the improper system to recruit human resources was criticised by the interviewees. The improper recruitment system was raised as a possible reason behind these deficiencies:

> *"I have to admit that our recruitment system was not well-established. This issue has been criticised by the ICAO at the USOAP 2007. We are trying to improve and develop a system thus new officers will be qualified people."* (Beno, a government officer)

Specifically, the interviewees criticised the recruitment mechanism to attract qualified and competent pilots. They observed that many airlines recruited unqualified pilots. Agi, a public analyst, stated that this practice existed because of an imbalance in the growth of the aviation industry and the availability of human resources.

> *"It cannot be denied there was pilot karbitan[4] in Indonesian aviation. These pilots were co-pilots who did not qualify as a pilot but had been forced to become a pilot. Unhealthy competition created this phenomenon but the main issue was the regulator. They seemed pretending not knowing this practice happened."*

Another interviewee also mentioned the *pilot karbitan* issue arose because of the high accidents and incidents rate in 2004 – 2006. Another explanation of this issue could be a result of the shortage of capable resources.

> *"Rapid growth of the aviation industry was not followed by the improvements of quality and quantity of resources (people, technology, facilities). Moreover, preparing a qualified-experienced pilot needs years*

[4] *Karbitan* is a term used to describe someone who is not qualified enough for a condition or position but supported and/or forced by powerful people or groups. Thus, *pilot karbitan* describes a pilot who is not qualified and proficient enough to handle pilot tasks.

> *so up-grading a co-pilot to a pilot is an easiest way, likewise, it will also reduce cost and time. Thus, a term of pilot karbitan came up."* (Anto, a consultant and academic)

> *"That was a fact that Indonesia had not enough pilots but the demands of them were very high, so, a co-pilot would be upgraded to a pilot to solve the issue."* (Ani, a CEO of an airline)

Operators were not the only actors who had inadequate knowledge in aviation but also people at the regulatory body. It was one of the regulator main problems, as stated by Odi. He sometimes had to work with the government officers who were decision makers but had no experience or idea about aviation. Thus, he had to simplify all terms and conditions for them but often they still did not understand.

> *"Sometimes I have to find a simplest way to explain aviation terms to them but still they could not get the point. The worst part was they did not want to admit that they did not understand so any suggestion or recommendation was often refused. Then, when they took a decision and it failed, they blamed us."*

Likewise, the interviewees observed the legislature had not enough knowledge about aviation. Thus, this became a barrier to establishing cooperation with the regulator.

> *"We know that our parliamentarians, particularly in Commission V, had insufficient knowledge about aviation. It was another dilemma for government and airliners because when they propose having hearings or discussions for any topic related to aviation, they often received no relevant feedback but only political speeches from the parliamentarians."* (Masya, a retired pilot and academic)

> *"Our parliamentarians, especially Commission V, had no knowledge about aviation. That was why when an accident or incident occurred; their speeches were often irrelevant. So, with these people, who will issue an Act on aviation, I don't have high expectations."* (Gery, a pilot)

The interviews clearly identified insufficient knowledge as one of the deficiency factors in the Indonesian air transport system. Banu explained how insufficient knowledge led to decision errors in the Adam Air DHI 574 accident while Yani concluded the condition as Organizational Accident, as defined by James Reason (1997).

> *"In the Adam Air case was really clear that the pilot and co-pilot did not know how to react and deal with the emergency situation when they detected there were defects at the IRS."* (Banu, a retired pilot and academic)

> *"That is what Reason's called an organizational accident. The cockpit crew committed errors because their airline did not provide adequate trainings. Thus, there was a chain of failures but often neglected."* (Yani, an investigator and academic)

Echoing the quotation above, Karman (a journalist) underscored the inadequate training at Mandala Airlines MDL 493 case:

> *"Inadequate training was not a new case in the Indonesian aviation. Mandala's accident in 1999 was caused by the pilot failing to land his aircraft properly. If I am not mistaken, the airline did not provide sufficient trainings either in a simulator or in class."*

In that case, the cockpit crew made wrong decisions because of inadequate training. The PIC misjudged the use of a 30 degree flap setting for landing and this caused the aircraft to land approximately 1000 meters beyond the target touch-down point.

Yani, an academic and investigator, viewed the trend to reduce training as a consequence of deregulation. Many of the new airliners have insufficient knowledge of the aviation industry, so, to survive in a tightly competitive market, airlines made efficiencies that often cut necessary costs, which possibly reduced safety.

> *"Deregulation had caused many problems in our aviation. The regulator deregulated the air transport system that aimed to stimulate the market because new airlines would be born. But, the regulator forgot to prepare the resources either of humans, regulations or facilities. Consequently, the regulator could not regulate the aviation operation. The competition became unhealthy and unethical; the airlines did anything to survive in the market, such as cost efficiencies which often ignored safety."*

Kompas daily newspaper quoted Captain Toto Subagyo, a former Chief of Garuda Aviation and Training Education as stating that the Indonesian pilots previously were knowledgeable until operators reduced training for cost-efficiencies.

> *'The Indonesian pilots' proficiencies were highly appreciated in Asian regions. That was a reason of why Indonesian pilots were in highly demand by various airlines in Asia. "It was until few years ago in which the quality of pilots' trainings was still good. Sadly, in recent years there is a trend, especially with new entrants, to reduce numbers of trainings", said Toto. Toto stated some airlines proposed reduction of training programs from the standard for cost efficiency.'* (Kompas, 10/09/2005, p.35)

The interviewees admitted that there were many competent and capable people in the system, but they often did jobs not related to their expertise, thus affecting their performances. For example, there were vital positions that should have been filled by experts with qualifications appropriate to the area of responsibility, especially if the position required them to take decisions; but sadly inappropriate appointments were common. This was also often caused by 'senior-junior' nuances that were very 'thick'. Seniors were given high priority to fill some positions although they were not competent enough. Darun implicitly stated there were leading people with insufficient knowledge of aviation. He pointed out his 'boss' as an example. He and his staff had sometimes argued just to convince their 'boss' about one issue:

"If a top level person is someone who understands their tasks so he will able to enforce his staffs to learn and improve their knowledge. But in our case is vice versa. We are educated enough on aviation but not our 'boss'. It is impossible for us to force him to widen his knowledge because we don't want to get into trouble by criticising him. Honestly, sometimes we have to argue with him and it was not easy to convince someone [boss]."

Similarly, Harun did not deny that many people who have responsibilities with aviation-related activities have inadequate knowledge about aviation. He also mentioned the rules were not clear enough because the designers (parliamentarians and regulator) had inadequate knowledge of aviation. Subsequently, those rules can be multi-interpreted:

"No..no... I disagree that our regulations are well enough. They, who established the rules and regulations, had no knowledge on aviation. That is why they could not see the holes in our regulations."

Indeed, there were many people in the regulatory level who were not the right person to fill the job. It was not because they were capable but their hierarchy level led them into the jobs.

"[The] regulatory system for the officers' position is based on their careers. Instead of capability, level of hierarchy is often used for one's position. Seniorities are also often used to fill a position. So, some officers have inadequate knowledge for that position but as a senior he has to fill that position (Sukri, a senior journalist)." (Sukri, a senior journalist)

Agreeing with Sukri, Aman (an airline Chief Operating Officer) also pointed to the bureaucratic system.

"Many vital positions were filled by people with irrelevant background and expertise only because they were senior and had higher level in government hierarchy."

The Indonesian bureaucratic system made it possible for people who have no background about a position, to fill the position according to their grade in the government hierarchy. Hence, there were capable and competent persons who did not work in their area of expertise. These factors contributed to deficiencies in the Indonesian transport system. This was agreed with the interviewees. For example:

"I am absolutely sure if we [the Indonesian air transport actors] improve our knowledge in aviation, those problems such as accidents or incidents, downgraded of safety rating, and the operating ban, will not ever happen again. We have lack of knowledge." (Karman, a journalist)

"[There was] lack of knowledge. Yes, that was the problem of this country. Knowledge is not only about formal education but also informal education and experience. For formal education, we know that we have reputable institutions for air transport but formal education is not enough, it should be improved and upgraded continuously because of the rapid growth of aviation studies. Furthermore, knowledge without implementation may led to deviations. Why? Because we never know the appropriateness and

> *applicability of knowledge without ever apply it. Thus, lack of knowledge shows one's capability."* (Masya, a retired pilot and academic)

So, although some people were capable in certain areas, they were still incompetent for some positions. One example of an interviewees' specific observation was:

> *"I will point my finger to the regulator. Let's see, there were some vital positions filled by persons who should not be there because they had no knowledge and expertise in that area. Aviation is not a simple organization but complex. Thus, a decision should be analysed and thought carefully since it might possibly lead to an accident."* (Andi, an academic)

Dani stated that limited sources and workloads had also contributed to lack of those competent people to learn about their new position.

> *The Indonesian bureaucracy system allows someone to fill a position that may be irrelevant to his/her background. They are capable but in other areas. Likewise they have no time to learn about their new position as there are limited resources and the high workloads* (Dani, a CEO of airline)

While Harun emphasized Dani's statement above:

> *"Yes, there were limited budgets to conduct training, workshops or seminars. Usually when a new officer fills a new position, they will concentrate with prior and present tasks of that position. But often, while they are still learning of their tasks, they should make decisions. Thus with the amount of works and limited time to learn, the decision, sometimes, was not good enough."*

To sum up, deficiencies were identified in the Indonesian air transport. Figure 5.5 presents the distribution of each category of deficiency according to the interview data. The deficiencies relating to rules had the highest frequency. These deficiencies were mentioned in 40% of the total deficiencies revealed, followed by the deficiencies related to enforcement (37% of the total deficiencies revealed) and, finally, the lowest frequency was the deficiencies related to knowledge, with only 23% of the total deficiencies revealed.

Of the ten deficiencies identified, those related to enforcement are the main problems; they have been clearly demonstrated in this section. To be more specific, the interviewees emphasized that deficiencies mostly occurred on the regulatory level. At this point, it can be summarised that deficiencies in rules tended to affect the enforcement at the operational level while deficiencies of knowledge weakened the enforcement at the operational level. Hence, the combination of these three categories of deficiencies clearly influenced performance at the operational level.

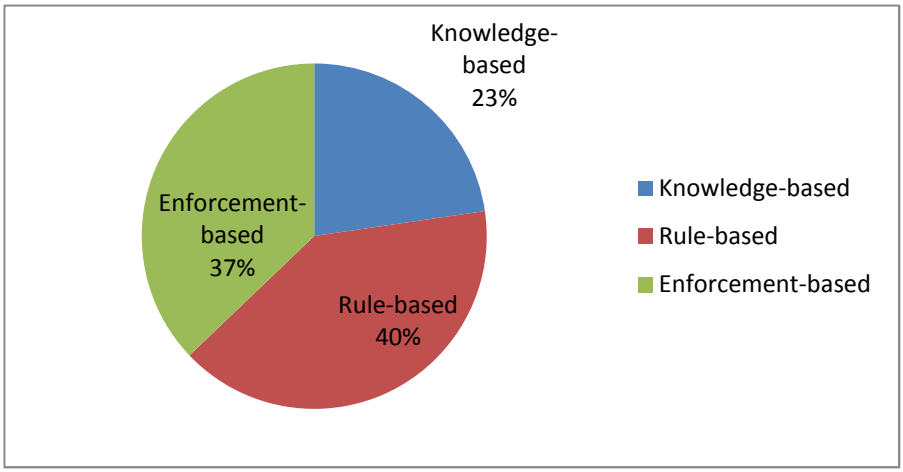

Figure 5.5 Distribution of each type of deficiencies according to interviews

5.4.1.4 Threats in the Indonesian Air Transport System

> *"Yes, people are the causes of accidents and incident [of aircraft] in Indonesia. But, our system influenced people. It was not a new story if we heard news that a good person changed to be a bad one after he entered the system."* (Yadi, an operational director of an airline).

Besides identifying the deficiencies as the causes of accidents and incidents in the Indonesian air transport system, this study, additionally, identified three threats that were revealed from the interview data. The interviewees clearly defined the threats as the results of interaction of individuals in the system. These threats were perceived by the interviewees to influence the system in parallel with the deficiencies.

These threats were: *manipulation, bribery* and *collusion* (see Figure 5.6, below). A detailed explanation of each threat follows.

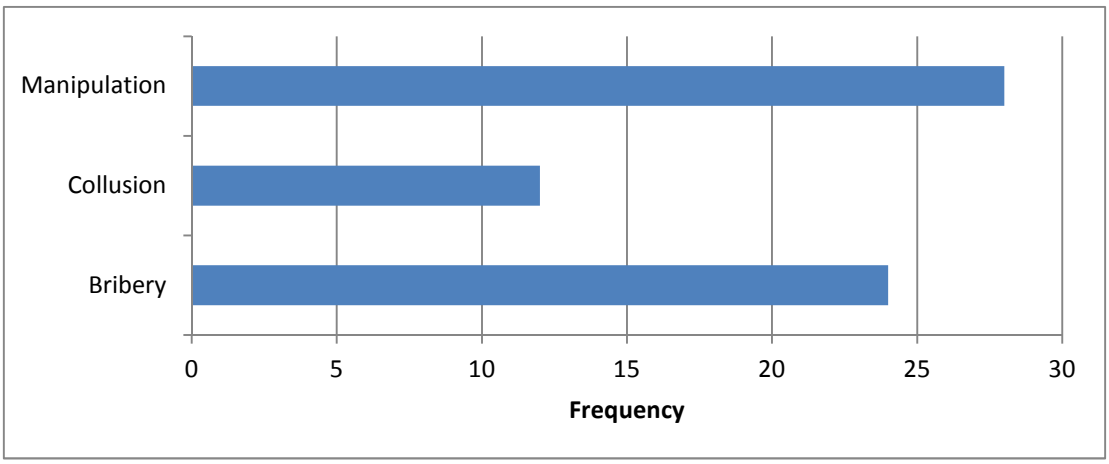

Figure 5.6 The threats in the Indonesian air transport system

Talking openly about these threats was a sensitive matter, but the practices certainly existed in the system. Only the practitioners talked about these threats. They viewed them as rooted in the system. Therefore no matter how much improvement to be achieved in human behaviour, a lack of reform in the wider socio-technical system meant that human performance improvement would be pointless. For example:

> *"The [air transport] system is failed; problems are in all levels of the system. To reform people but not the system is not a solution. Both should be reformed at the same time."* (Hani, a CEO of an airline).

> *"Our [air transport] system is bad. People changed when they entered it. To focus reformations only onto people would not be effective without reformed of the [air transport] system."* (Sukri, a senior journalist).

These threats occurred at the operational level as the result of human deficiencies, either in knowledge, rules or enforcement. The following explanations provide a perspective on each threat.

5.4.1.4.1 Manipulation

The first threat identified was manipulation, referred to as achieving a purpose by making unfair or artful changes. Wira (an aircraft engineer) stated there were 'oknums'[5] who did this practice to deceive others. He gave an example how *oknum* manipulated reports to deceive inspectors:

> *"There were manipulation practices in the aviation activities. There were 'oknum' who did changes of something for various reasons. For example, they manipulated maintenance reports to deceive inspectors."*

This threat occurred mostly at the operational level. An interviewee, Kris (a journalist), knew exactly how manipulation was practised in the Indonesian air transport system. But it was quite hard to prove this practice when, in some way, it benefited some 'powerful' persons. This was not clearly defined by the interviewees but explicitly.

> *"Don't you think there was 'someone[6]' who was backing up this practice [manipulation]? It was impossible to manipulate things without a 'backing[7]'. If there was no one behind the scene, I don't think an officer dares to commit manipulation."* (Kris, a journalist)

[5] *Oknum* literally means person. This word has negative connotation to describe a person that does something wrong.
[6] The interviewee stressed this word when he stated it. He implied this word to persons who back-up an individual when he committed manipulations thus the individual felt secure and confident to manipulate things.
[7] This word was used by interviewees to show there were invisible persons who protect an individual committing manipulation.

> *"There were oknum whether in the regulatory body or operators. Those people committed to manipulations to gain some benefits. But, sometimes manipulations had been done by the officers or staff because they were forced to do this practice. Oknum in higher position used their authorities to make people in lower position to do whatever they wanted to do though they know the practices were prohibited."* (Agi, a public analyst)

The interviewees clearly observed some manipulation practices in the aviation activities. The interviews reflected manipulations often occurred in the operational level, especially maintenance. An example of their specific observations was:

> *"Two log books are needed to protect the manipulation practices. An original log book records manipulation while another book is used to be shown during an inspection."* (Karman, a journalist)

Budi agreed with Karman. As a senior pilot, he knew of this practice. He said that sometimes he had argued with the management or technicians for safety reasons.

> *"They (management and technicians) did manipulations to any items; they ignored safety; for example, replacing an item with bogus part. It was difficult for us as a pilot who has to fly the aircraft because we know how dangerous it is."*

Additionally, manipulation not only occurred with regard to the aircraft, but also in ground handling area. Manipulation at the cargo area was stated by eleven interviewees. They mentioned that the cargo area was a '*basah*[8]' area. To manipulate the weight of a cargo was a common practice.

> *"An officer at the cargo area will weight a cargo; for example, a cargo was 30 kg. Then, a customer should pay Rp.30,000/kg so in total he should pay Rp.900,000. Here, the officer reported that the weight was 25 kg and the payment was Rp.750,000. So, the officer gained Rp.250,000 from a cargo."* (Ludi, an aviation analyst)

Agi had received many complaints about manipulation practices, which caused passengers to become victims.

> *"Manipulation is anywhere in the system as a result of the badly established system. At the end, passengers are people who will lose at the most. For example, how could two tickets that were exactly the same issued? Or the payment of excess luggage was not reported so the officers kept the payment in their pocket."*

Although this kind of practice is known and tends to be a contributing factor to accidents, there is rarely further investigation after an accident occurs. The issues were not only in the

[8] *Basah* is a term that is used to express a position, location, condition or situation, where lots of money is involved.

regulatory body or the legislator, but also in operators. Wira knew that many unsafe practices were applied in the Indonesian aviation. He mentioned some airlines did not know how important maintenance was. It was vital, so that spare parts could not be replaced with 'abal-abal[9]' just for efficiency reasons, and the proper maintenance process should be carried out in certified workshops. Using bogus parts has been known widely by the actors in Indonesia, as found by the EKKT team[10].

> *"Using abal-abal or bogus parts is a common practice to reduce costs of maintenance. There is the GMF [Garuda Maintenance Facility] that is reputable and recognised internationally but some operators do not want to do maintenance over there. Besides costly, of course the GMF does not want to manipulate or do illegal services."* (Wira, an aircraft engineer).

Correspondingly, Harun admitted there were such practices as described by Wira. However, he mentioned that these practices could not be only from one side; there could be two sides or even more. Thus, the regulator also played a significant role in making this happen. Harun explained that many operators viewed safety as something that can be negotiated. For example, in the maintenance system for engine load, the inspection period was 2500 hours before the engine has to be serviced. Then some concessions were given, even sometimes up to 3000 hours. Both, the regulator and operators assumed that a 10% deviation was still safe, but there was no basis for this assumption. Undeniably, there were many concessions in the Indonesian aviation system and, of course, concession was a source of *KKN*[11]. Harun explained that lack of knowledge led to these kinds of practices. Both parties did not know that safety has limitations.

5.4.1.4.2 Bribery

Bribery was the second threat and it refers to the bestowing of a benefit in order to unduly influence an action or decision. Bribery was a common corruption practice in the aviation industry as stated by Agi. He viewed this practice as related to the not well-established legal system, bureaucracy, and the quality of resources. He mentioned that bribe money was often called as '*pelicin*[12]' and that it was mainly used to fast track the approval of licenses or any matters related to administration. Bribery was often practiced to get licenses. The bribe money was needed to accelerate the licensing process, even though an airline fulfilled all requirements. Without bribe money, the license will be stuck somewhere.

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[9] *Abal-abal* is a term used to describe something with lower quality or even fake, such as electrical equipments, mechanical equipments.
[10] As described by the members of EKKT team during field work.
[11] *KKN* is acronym of Korupsi, Kolusi, and Nepotisme or Corruption, Collusion and Nepotism.
[12] *Pelicin* is term used to describe bribery practice. The bribe is needed to fast-track or smooth any bureaucratic process. Some scholars (e.g., Vickers) who did study about Indonesia also named *pelicin* as 'glossy money' or 'cigarette money'.

> *"You may ask new airlines or airlines that are waiting for licenses approval. There was a need to speed up the process so paying some amount of money was common. Without pelicin the licensing approval process will take longer time. High pelicin paid often make the process much faster."* (Agi, a public analyst)

Similarly, Odi admitted this kind of practice in the aviation operations but he disagreed that this practice was because of lack of enforcement. Both enforcement and bribery have cause-and-effect relationships, so they are interrelated.

> *"The regulator has insufficient numbers of inspectors so an inspector has lots of tasks. Likewise his payment rate is similar with other officers who have fewer tasks. This condition is an opportunity for nakal[13] airlines. Money is the solution. The airline is giving some amount of money to the inspector who will approve some concessions. For instance, the inspector found the IRS should be replaced because there are recurring defects. Since he received some money then he approved the IRS although it is not yet replaced."*

Moreover, bribery also appeared in aircraft procurement because it needed regulatory approval before the aircraft was purchased. Thus, the airline will try to get close with an officer from the Department of Transport to get approval easily and, of course, by paying some money.

> *"There is a code of practice in bribery, called as 'tahu sama tahu'. So you should know what you supposed to do if you want everything will be proceeding faster."* (Agi, a public analyst)

> *"The amount of money involved is varied; the more money, the faster the process."* (Kardi, a pilot).

The same practice was also revealed in getting a license for a new airline route. Here, the amount of bribe money depended on which route had been chosen. The interviewees did not talk this issue openly although media articles many times stated about the practices.

> *'A member of the Evaluation of Transport Safety and Security Team, Tengku Burhanuddin, added, the potential for bribery to be practiced in licensing, might occur in the licensing process to get business licenses, aircraft procurement or license for a flight route.'* (Kompas, 15/08/2007, p. 18)

> *'"It depends on lobbying. Without paying money, SIUP[14] is impossible to be issued. Actually we had already fulfilled all requirements, but the processes were always being decelerated," reported a director of a scheduled airline.'* (Kompas, 16/08/2007, p. 18)

> *'"If the route is fat, like Jakarta – Surabaya, it can be IDR500 million. But, if the route is thin, like Jakarta – Papua, it will less than IDR50 million," stated a director of airline operation.'* (Kompas, 16/08/2007, p. 18)

[13] *Nakal* is a term that is commonly used to define someone or a group who often used illegal ways to achieve their objectives.
[14] *SIUP* is acronym of Surat Izin Usaha Penerbangan or Airline Business License.

Thus, the practices of bribery and the amount of money circulated were different, depending on the purpose. However, it cannot be denied that the practices were there although difficult to prove.

5.4.1.4.3 Collusion

The last threat, collusion, referred to secret agreements or cooperation to benefit a particular party. Harun did not deny this practice in aviation activities. He compared the practices of collusion before and after deregulation. Before deregulation, collusion was practised among 'powerful' people; for example, there was no tender process for procurement of goods but direct appointments. After deregulation, that was also supported by the reformation era, where the practice had shifted slightly. There were no direct appointments as before, but projects for certain amounts of money would have an open tender procedure. Here, they often practised compromises between the committee for the project and the applicants, so the agreement among them will benefit only certain people or groups.

> *"Prior to deregulation and reformation, collusion occurred among top level people who have power. Nowadays, collusion occurred from top to bottom. At the top level as recently revealed by the KPPU[15], there is an indication of compromise between some airlines for fuel surcharge. Likewise, direct appointment of suppliers of goods still occurred in the bottom line, maybe because the amount of money involved is not as much as at the top level."* (Harun, a government officer)

Agi and Wira stated that some airlines are '*memelihara*[16]' government officers, particularly, inspectors. By maintaining this kind of relationship both parties, the officers and the airlines, would benefit.

> *"Everyone knows that many airlines 'memelihara' officers for their benefits. Of course, these officers will get benefits, too, since they will receive additional income regularly."* (Agi, a public analyst)

> *"The officers will get some 'pocket money' besides other kinds of gifts such as holiday package or the latest gadgets. Likewise the airlines gain benefits too. They will be protected if they are found to break or violate the rules or will know any news related to the regulator actions before the news is announced."* (Wira, an aircraft designer).

It was clearly identified that collusion was one practice that still existed in the Indonesian air transport system. Although the evidence of this factor was not as high as other factors, the

[15] *KPPU* is acronym of *Komisi Pengawasan Persaingan Usaha* or Commission for the Supervisory of Business Competition of the Republic of Indonesia.
[16] *Memelihara* literally means take care of, protect, raise, keep or maintain. Here, '*memelihara*' is used to describe someone who has paid to protect or guard.

practices occurred in the Indonesian aviation activities. For example, direct appointment of suppliers for procurement goods was a common practice of this factor as was stated below.

> *"Direct appointment of suppliers was preferred practice; they (the regulator or the operator) said that direct appointment is easier and faster because they know who the suppliers are."* (Burhan,a government officer)

In sum, these threats are presented in Figure 5.7. The figure presents two threats that were mostly practices in the Indonesian air transport system, manipulation and bribery. The frequency of the manipulation mentioned by the interviewees reached 44% of total interviews while bribery was 37% of the total interviews. The lowest frequency was collusion with only 19% of total interviews. Manipulation and bribery often work together. Manipulation occurred if there were lack of control. The authorities (e.g., regulator) that were supposed to control would be bribed to keep them silent. All of these threats affected the performance of the Indonesian air transport system. The performance of the system decreased because of deficiencies of actors in the system.

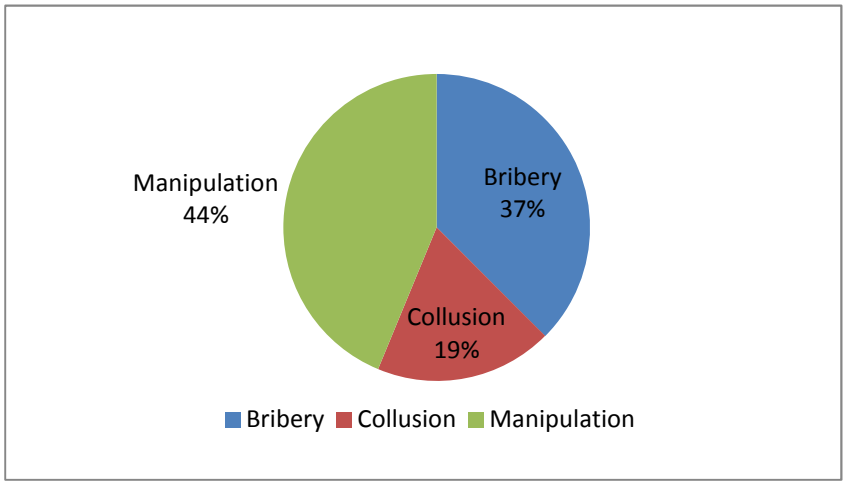


Figure 5.7 Threats in the Indonesian air transport system

5.4.2 Poor Performances in the Indonesian air transport system

The interview data showed that the deficiencies of individuals affected their performance in the aviation-related activities. These deficiencies were also influenced by the threats occurred in the interactions of individuals in the system. A combination of the deficiencies and the threats resulted in poor performance. The majority of the interviewees agreed there was poor performance. The academics and the academics who were also practitioners had the same opinion; there was poor performance. All but one of the practitioners agreed that lack of

performance was the main issue in the Indonesian air transport system. In contrast, interviewees from the regulator were divided equally into three groups: agree, disagree, and did not answer the question.

Figure 5.8, below, shows that performance was the main issue in the air transport system. This was agreed by 89% of the interviewees while other 7% of the interviewees disagreed. The other 4% of the interviewees did not answer the question. Additionally, some of the interviewees mentioned the causes of lack of performances. They stated there were at least two factors related to the performances, perception and safety culture, as presented in Figure 5.9, below.

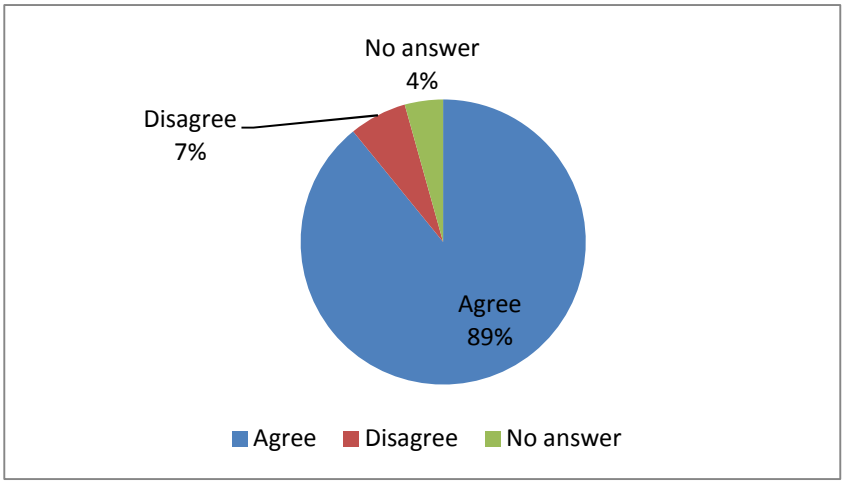


Figure 5.8 Lack of performances is the main issue in the Indonesian air transport system

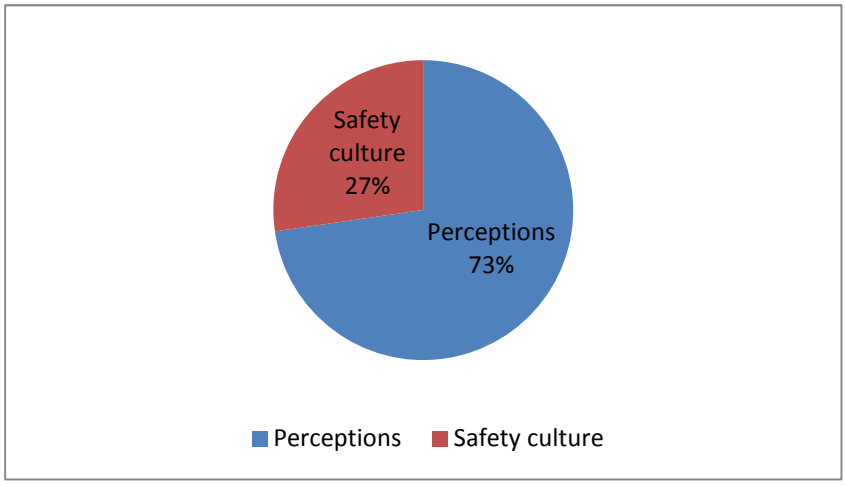


Figure 5.9 Factors that affected the performances

Perception was mentioned many times - 73% of the total frequency of factors affecting the performance – by the interviewees while safety culture was only 27% of total frequency of factors affecting the performance. These factors, perceptions and safety culture, were developed

over time since the establishment of the system and this development process appeared to have been overlooked or even ignored by scholars in aviation accident studies.

5.4.2.1 Perceptions

The interviewees claimed the Indonesian aviation actors had various perceptions of aviation terms. They viewed various perceptions were caused by no benchmark or standard. Examples of their specific statements were:

> *"Society does not understand about aviation safety. Knowledge is not only the regulator's responsibility but also academics, practitioners and anyone who has better understanding about safety. This function does not work, even most of us are not aware of it. So we have no standard or benchmark for aviation safety. We have different perceptions about safety. All actors have their own perceptions about safety, from the regulator, operators, academics, even users."* (Dani, a CEO of an airline)

Similarly, Madi (an academic) agreed.

> *"Undoubtedly, different perceptions are the main issue in our aviation system. We have different perceptions about safety, different perceptions about rules, different perceptions about right and wrong. We have various perceptions of many things. Why? Because there is no benchmark, no standard."*

Hani (a CEO of an airline) disagreed that the regulator and operators have different understanding of aviation safety. She saw socio-culture as the main issue, which led to the lack of safety sense of passengers. She also criticised the loose enforcement. Thus, safety compromises seemed easy to be negotiated by money.

> *"In my opinion, the regulator and operators' understanding of safety was excellent but not the passengers. I observed this was coming from family; it is common to break rules in our culture. For example, a kid sees how their parents don't use helmets when they ride a motorcycle. Furthermore, the motorcycle for two riders was used for parents and two children. When a policeman saw this practice, he often pretended not see it or he stopped them. Stopping them will bring a negotiation for an amount of money thus any violation will be forgiven."*

Besides safety culture, an interviewee underscored how safety perception was diverted because of money.

> *"Money..money...and money that has diverted perception of safety. Money can change improper maintenance into proper maintenance. Money can extend time between overhauls. Money can buy airworthiness licenses. So, money is a power to change perceptions."* (Gery, a pilot)

Beside the changes in safety perception, an accident was still seen as an *Act of God* although there were scientific explanations from the NTSC or the regulator. Those explanations still did not change perceptions about an accident. For example, the Adam Air DHI 574 accident in 1

January, 2007; it was *a New Year*, but an accident occurred. The media reported from many aspects and even speculated on the causes of accidents. There were many scenarios and misleading information, even superstitions.

> *"We like to hear what we wanted to hear, and the more interesting news, the greater enthusiasm will be achieved even though the news is not logic."* (Agi, a public analyst)

> *"Do you remember the Adam Air [DHI 574] case that was missing in 2007? If you re-read media reports of the case, then you will see there were many speculations about it. Maybe you still remember how the authorities employed dukun[17] to find the aircraft. In Addition, people tended to view the accident that it occurred because of God's action to punish our elites."* (Deni, a journalist and academic)

Odi (an academic and investigator) agreed that the accident was often viewed as punishment of God so the leaders had to be '*ruwat*[18]'. He argued that an accident or incident is a fate but he did not deny this paradigm in Indonesia.

> *"This is a fact in our country. Cultural and religious perspectives are so thick, so these perspectives are also used to solve any problem; for example, the public wants our leaders to be ruwat."*

Some people to avoid responsibilities often used this paradigm as an excuse. For example, a religious slogan, "we do our best but God is the decision maker" was often used to claim there were actions to prevent an accident or incident but God had decided differently, so, the accident happened. Additionally, once an accident occurred then the media were more interested in writing about the human aspects instead of educating the public with knowledge about the accident, such as its technical and environmental aspects.

> *"I think to write about human aspects is easier than technical and environmental aspects."* (Madi, an academic)

> *"We cannot deny there were journalists who wrote reports without conducting investigations before they released the reports to the public while their objectives often were just for gaining more profit. Thus, reporting human aspects so far attracted more customers."* (Hani, a CEO of an airline)

Agi (a public analyst) also viewed this paradigm in similar manner. But he blamed the dysfunctional nature of the regulator who did not provide the public with appropriate knowledge. Public knowledge was a responsibility of the country as stated in Indonesian legislations. Even the regulator has slots to be used in the media for educating people but Agi

[17] *Dukun* is similar to a Shaman.
[18] *Ruwa*t is Javanese tradition. Literally *ruwat* means to destroy, to clean, and to eliminate bad lucks. It aims to prevent and avoid bad luck by conducting ritual ceremony included prayers or spraying with water that has been blessed.

rarely read or watched any programmes from the government that delivered knowledge to the public.

> *"The regulator has to be responsible for education; that is their responsibility. They can use the media to educate people because the media is a useful tool to deliver information. But, I didn't see the regulator using them [medias]."*

In contrast, Burhan argued that the regulator was the most responsible body. He admitted that education was the regulator's function but also the responsibility of academics, practitioners and anyone who had knowledge about aviation. This function was not working and was not well-understood. If there was an accident, each party started to blame others and argued, because they thought they had done nothing wrong. As a senior government officer, Burhan denied that the regulator did nothing to educate the public about accident and safety. He gave examples of seminars of aviation safety that were held by the regulator, advertisements and brochures that were distributed to the public.

> *"Everyone blames the regulator. Hey, it's not only the regulator who is responsible for education; but all of us, from academics, practitioners, and also persons who have knowledge on aviation. In my opinion, the regulator held workshops, seminars, distributed pamphlets and brochures, to deliver knowledge. We did well enough!"*

However, Odi and Agi viewed that the regulator's efforts to educate the public were only lip service to show that they did do the work. But there were no significant results since the programmes had never been evaluated and monitored. Therefore, there were no outcomes and the programmes could not be judged to see if they failed or succeeded. Dian agreed that there was no evaluation or monitoring from the regulator to their programmes. She felt the regulator's programmes just wasted money and did not achieve the objectives to educate the public about safety.

> *"Ah...I don't trust them [the regulator]. Too many lies or if there were some works to educate people, but no monitoring and even evaluation."* (Odi, an investigator and academic)

> *"I don't know which program to educate people about aviation. They [the regulator] were only communicating aviation programs to limited people but not to the public. Limited people at high class places, did those actions called communication?"* (Dian, a CEO of an airline)

Accordingly, she agreed that knowledge was a main issue. As a practitioner, she described difficulties in dealing with safety issues. She noted it was often easier to deal with mechanical and technical matters than humans. For example, a passenger's companion was often allowed to enter the arrival lounge where it should be 'clean' from people except for passengers and

authorised people. Sometimes porters, taxi drivers and other people could be seen entering these areas. Letting unauthorised people enter this area decreased the security and safety of the airport.

To sum up, they all agreed that Indonesians often view an accident or incident as fate, and people who were injured, or even killed, are viewing as having bad luck. The inability of the regulator to deliver knowledge to the public was seen as one of reasons for this paradigm.

5.4.2.2 Safety Culture

Safety culture was the last factor mentioned by the interviewees. The interviewees perceived that safety culture was related to knowledge, rule and enforcement; for example,

> *"I will say the main issue is the safety culture. The root is humans, of course. In my opinion, if I ask to do something to improve our air transport system, then I will focus on safety culture. So, knowledge about aviation safety should be delivered, rules should be clear and comprehensive, and the most important is enforcement. If these all can be established and practised daily or routinely, through the time, safety becomes a culture."* (Odi, an academic and investigator)

Hence, safety culture developed over time. Knowledge in aviation safety was a base with rules used to guide. Enforcement needs to ensure implementation of knowledge was in the framework. Through time, these three factors developed culture.

> *"We need to establish a safety culture. A safety culture is about letting safety become a need and a habit; it is like breathing which needs oxygen. If the safety level of every individual has improved then they will bring this into a small group, then society and, finally, it becomes a national culture. No doubt, to develop culture takes a long time. It is not about a year or two, but even hundreds."* (Yadi, an operational director of an airline)

But, one interviewee felt that these three factors were not applied properly in Indonesia.

> *"I believe safety culture is the main reason of all troubles in our aviation system. There are three terms that can be used to define the condition of human in this system. First, they know but ignore. Second, they know but are not doing. And the last one is that they obey only if they are being controlled. So, with these kinds of attitudes then how can a safety culture be developed since the regulator was not properly enforcing the rules while they also were not educating public"* (Ani, a CEO of an airline)

Catur, an academic, agreed that enforcement was a factor in discipline and developing a safety culture. The rules should be enforced until enforcement was not needed anymore. At that level, safety would already have become a habit and, finally, become a culture.

> *"Enforcement is essential. Rules should be enforced until they do not need it anymore."*

Additionally, Beni (an investigator) stated:

> *"Safety culture should be generated and driven from the top level to the bottom line so it should be forced until it is a self-working behaviour. At the same time, safety management should be introduced as knowledge for a foundation of the safety culture."*

The interviewees perceived that leaders, whether at the regulator or airlines, often did not show good attitudes to support safety implementation. For example, before taking off, those people often did not turn off their electronic devices although they had been warned by flight attendants several times.

> *"I experienced that some VIPs did not want to follow the instruction to switch their electronic devices off. Often they still kept talking by their mobile, while we interrupted them; they were angry."* (Didi, a senior flight attendant)

Therefore, enforcement of rules and procedures was an issue to the establishment of a safety culture in Indonesia. The interviewees highlighted the importance of leaders' commitments to develop safety environment.

Furthermore, the Indonesian political system, with 'separation of power' into legislative, executive, and judiciary may, in some way, have affected the performances of the executive because lack of knowledge and certain political interests tended to put low priority on aviation safety. Thus, legislation in aviation took decades to be approved.

> *"Organizations, including air transport, are always influenced by economic and political trends. The Indonesian 'separation of power' system is a dilemma in aviation, especially for the regulator. The budgetary control held by the legislature limits the regulatory actions in the system. Often the legislature disagrees and rejects proposals from the regulator only because they think that the government allocates too much money to aviation. They do not know that safety is costly, because most of them, especially in Commission V that is responsible for transportation, have no background on aviation."* (Sapta, an academic)

Reviewing the factors affecting the performance of the Indonesian air transport system, there was strong evidence of the influence of knowledge, rules and enforcement. The deficiencies in the system that were looked at, significantly influenced the performances and, through time, became integrated into the system to negatively influence the safety culture. Likewise, the deficiencies produced various perceptions that were developed in conjunction with the quality of resources.

5.4.3 Safety Improvement

> *"This is a crisis, a climax of problems of aviation in our country."* (Budi, an academic).

Previous sections presented there were deteriorating processes occurred in the Indonesian air transport system. According to the interview data, the EU's operating ban in 2007 was viewed as a result of the accumulation of precipitating events in the Indonesian air transport system. The interviewees precisely stated about that:

> *"The operating ban is an iceberg effect. It is a top event of accumulating events in our aviation system."* (Windra, an aircraft maintenance officer)

> *"Refers to crisis cycle,..this is called a crisis, while accidents and incidents are preconditions."* (Dani, a CEO of an airline).

Another interviewee said the operating ban was a consequence of unrecovered and unsolved problems in the system:

> *"All accidents and incidents happened without explanation. Those events are warning signasl of failures in the system. But since all happened without adequate and proper explanations, those failures are accumulating. The EU concerned on this, consequently, the operating ban was imposed to all Indonesian airlines to enforce our regulator. Hence, the operating ban is a consequence of our vulnerable system."* (Andi, an academic)

Nevertheless, all interviewees had the same opinion that the operating ban was only the result of the many events in the system, such as accidents and incidents that were unsolved.

Accidents and incident should be investigated to understand *how* and *why* accidents occurred (and *what* caused it), so corrective and preventive actions can be formulated to avoid similar events happening again. The philosophy of investigation is 'nothing but the truth' to reveal the most probable causes of an accident. However, they are not only the direct causes, but also indirect contributing factors. The founder and the former Chief of the NTSC of the Republic of Indonesia stated,

> *"…our method or approach is based on and similar to the academic and scientific approach to discover the reasons and mystiques of the existence of life and the universe.*
>
> *But with an engineering mind to construct an effective and efficient way of finding the truth, and nothing but the truth about what, how, and why an accident happened."* (Diran, personal communication, 2010).

This statement implies that an investigation aimed only to reveal the truth to prevent recurrences. Therefore, an accident or incident investigation is used as a tool to understand the phenomenon behind an event and so enable preventive actions to be proposed.

The interviewees suspected three reasons for unsolved accident and incident cases in Indonesian aviation: dependency on the NTSC, politics and shortage of resources.

The dependency issue rose because of the possibility of a conflict of interests between the NTSC and the Ministry of Transportation (the regulator). Some examples of the interviewee's statements follow.

> *".....how the NTSC is able to criticize the regulator; since the NTSC is inside the system. Even the NTSC has no their own budget while some investigators also work for the regulator. Hence, it is clearly seen there are conflicts of interest."* (Masya, a retired pilot and academic)

> *"I do not believe in the NTSC investigation report. The NTSC is under the auspices of the regulator; and we all know that the regulator plays a significant role to cause troubles in the Indonesian aviation."* (Agi, an aviation expert)

> *"It is impossible that a son betrays his father; the one who raised and provided his needs."* (Yadi, an aircraft technician)

The second reason revealed was politics as stated by the interviewees, below.

> *"This issue rose long time ago; it was voiced out after a series of accidents and incidents in 2004 to 2006. Finally, there were three fatal accidents in 2007. But, there is no willingness from the government to establish an independent NTSC until today. Why? There are many interests; one of them is politics."* (Odi, an academic and investigator)

> *"I believe the truth was not revealed to the public to cover some 'powerful' people. Of course, the NTSC is being controlled for that, because they are not independent."* (Koko, a pilot)

Other interviewees viewed shortage of resources as an issue,

> *"A shortage of resources meant the NTSC could not accomplish its investigation tasks."* (Masya, a retired pilot and academic)

> *"The NTSC with their current resources had an inability to carry out all accident and incident cases. Consequently, some cases were not investigated by the NTSC, such as incidents."* (Oki, an investigator and academic)

Although there were some interesting factors revealed in line with unsolved accident and incident cases, some interviewees claimed there were improvements in the Indonesian air transport safety. The operating ban was used as the indicator to justify their statement. However, none of the interviewees agreed there were significant improvements in the Indonesian air transport system before EU applied the operating ban to Indonesian airlines.

Figure 5.10, below, presents the interviewees opinions of safety improvements in the Indonesian air transport system.

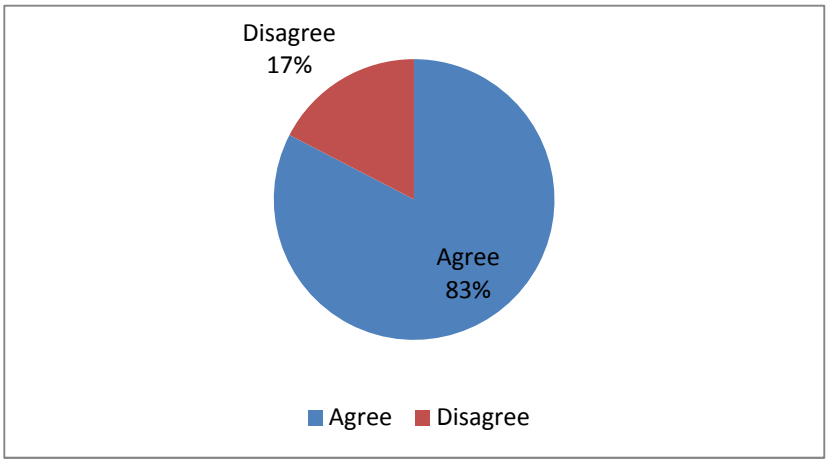


Figure 5.10 Improvements after the operating ban – agree or disagree

Their claims were based on various reasons; for example, there was the CAP prepared by the Indonesian authorities to respond the ICAO USOAP 2007 findings in order to enhance safety. All interviewees agreed that there were no improvements before the operating ban. In contrast, some interviewees agreed there were significant improvements in the Indonesian air transport system after the operating ban, as shown in Figure 5.11, below.

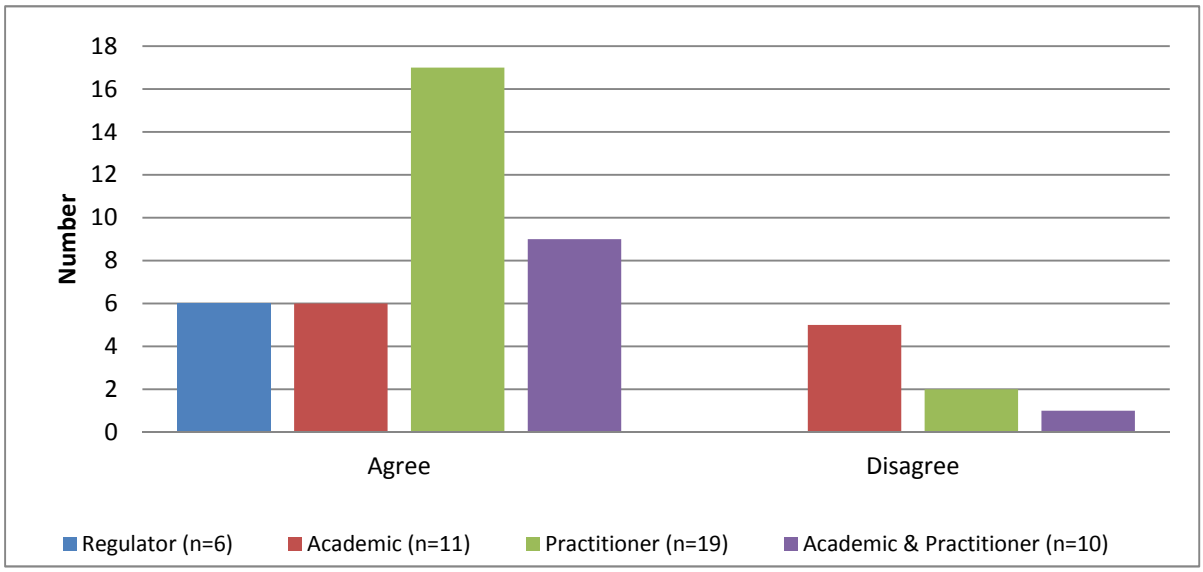


Figure 5.11 Improvements after the operating ban – interviewee groups

Figure 5.11 shows the breakdown by category of those interviewees who agreed there were improvements in the Indonesian air transport system after the operating ban. The government

officer stated there were safety improvements in the Indonesian air transport system; for example,

> *"I think there are many sectors that need to be improved. Without a doubt, Indonesian aviation is getting better, especially after the operating ban applied by the European Union. The condition has forced the regulator to improve its roles in the aviation world."* (Novi, a government officer)

> *"Currently, Indonesian aviation accidents have reduced significantly since the government commits to improve aviation safety and it is guided with a motto, "road to zero accidents". Therefore, I conclude that Indonesian aviation has improved recently. The regulator reviewed and revised the regulations. There are improvements in the [quality and quantity of] human resources. The ICAO criticised our human resource capability, so, the regulator established formal training programmes that comply with the international requirement."* (Beno, a government officer)

The operating ban was also viewed that brought a positive impact to the whole system. It gave considerable the momentum to improve aviation safety:

> *"Honestly, our air transport has improved compare to the last three years. There is improvement of the regulator's mentality as well as operators' mentallity. Currentlyothe regulator and operators have the same visions on safety as the being more important than other things. The organization did internal reformation and the Safety Management System or SMS has been applied, which complies with international standard. Previously, safety was not important but profit is the most important until the EU banned all Indonesian airlines. Then, we woke up.....Hellloooooo....!!!"* (Ani, a CEO of an airline)

In contrast, six of 11 academics agreed there were improvements after the operating ban in the Indonesian air transport system. For example:

> *"We have lack of knowledge about what aviation is about. So we need to have a same perception about safety, then we will have the same framework to improve aviation safety. Undoubtedly, after we were banned by the EU, many improvements have been done."* (Lase, an academic)

> *"Yes, there are some improvements in our aviation."* (Genta, an academic)

Another five academics clearly stated their disagreement. Examples of their statements are below.

> *"Bad, it is very bad. The regulator said there are improvements, but not for me. Before or after the operating ban, our air transport system is still bad."* (Anas, an academic)

> *"I do not see any significant improvements so far."* (Madi, an academic)

Most practitioners agreed there were some improvements in the Indonesian air transport system, only two practitioners disagreed because both saw that an improvement meant fulfilling the international safety standard and Indonesia was far from that.

"No, there are no improvements. What was happened in our aviation system is only look likely better in the surface but weak in the bottom." (Yono, a maintenance manager of an airline)

Furthermore, there was one interviewee from the academic and pracitioner group who disagreed there were improvements in the Indonesian air transport system after the operating banned was issued by the EU, while the other nine interviewees agreed:

"Indonesian aviation safety is getting better compare to three years ago, in particular after the EU banned. Aviation is the most safe transport mode as long all ICAO regulations are followed. But those improvements do not convince me to trust all Indonesian airlines." (Desta, a flight trainer and academic).

In summary, all interviewees agreed that there were no significant improvements before the operating ban. Although the majority of interviewees agreed that there were significant improvements in the Indonesian air transport system after the operating ban, some of the interviewees disagreed.

Additionally, the interviewees also elaborated their statements of the safety improvements in the Indonesian air transport system. They addressed some barriers to improve the system; *commitment and willingness, political system, covering issues and just fulfilling the EU's requirements*. Figure 5.12 presents the frequency of each barrier as mentioned during the interviews.

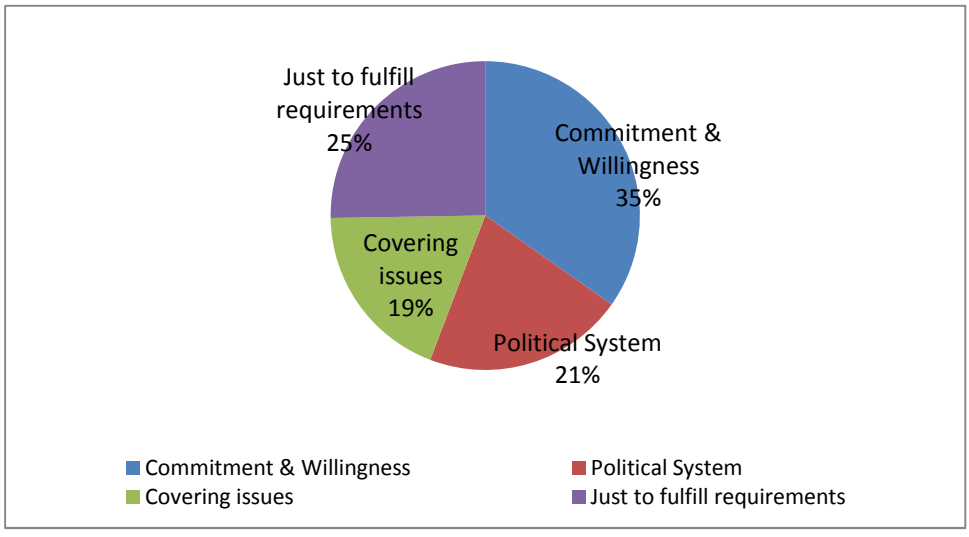


Figure 5.12 Barriers to improve the Indonesian air transport system

Commitment and willingness were identified as the strongest barrier to improve safety aviation with 35% of the total frequency. *Just to fulfil requirements* and *political system* were also mentioned at 25% and 21%, respectively. The weakest barrier was *covering issues*, with 19% of the total frequency. Each barrier was described in following section.

The interviews revealed there was a lack of commitmment and willingness of Indonesian leaders (e.g., the elites, top level management of arlines) to improve aviation safety. Most of interviewees said the willingness and commitment of the leaders to improve aviation safety were not good enough. They suspected personal or group interests as the reasons. The existing condition has given benefits to some people, particularly in the regulatory body, as mentioned by an interviewee:

> *".....but, improvements without commitments cannot last. So, commitment and willingness from all parties, especially the regulator and operators are needed. Honestly, I can see this willingness from some leaders but not from the regulator as an institution because there are some interests. Their interests result from self-security. Some actors are not willing to improve aviation safety because they do not want to lose their current benefits. So, these kind of people become a barrier to improving Indonesian aviation safety."* (Catur, an academic)

Likewise, such concern was also addressed to the operator.

> *"So, there is no improvement. The system is weak and vulnerable. This will never be improved until the regulator and operators learn what an aviation system all about. To achieve those things need commitment and willingness to learn, implement, and develop the system continuously."* (Banu, a retired pilot and academic)

Another interviewee also mentioned how the system also contributed to commitment and willingness of the persons inside the system:

> *"...working environment in the government sectors are not condusive, the officers have lack of commitments and less integrity to do their jobs. They are doing their tasks because they have to, mostly for economic reasons; need for money. The condition is also supported by our bureaucratic system. Although we did reform, it was only in the top level and the operational level was not touched."* (Anto, a consultant and academic)

In contrast, other interviewees observed the Act No.1/2009 was issued just to fulfil international requirement without having an understanding the appropriateness of the Act to the Indonesian air transport system.

> *"The Act No.1/2009 was issued just to fulfil the ICAO recommendation, but it does not reach the root causes in our system. The Act was adopted from Australia. I am not against it, but the regulator and the legislator did not conduct an appropriate study together with academics and practitioners to determine the root causes in our system. So, when they adopted the regulation, I suspect, they were unknowledgeable to know whether the Act contents are appropriate to improve the quality of our aviation system."* (Dani, a CEO of an airline)

Other two interviewees implied they were unimpressed with the improvements,

"I cannot deny that we have a comprehensive Act now and the regulator did internal reform as well. But, I hope these improvements are not only to answer the international concerns." (Lase, an academic)

"But, as usual, after no more pressures from the international bodies then we will come back to our old tradition." (Gyan, an aircraft engineer)

The regulator saw the Indonesian political system as a barrier to improve the Indonesian air transport system. Convincing the legislator to issue a comprehensive legislation on aviation was a tough job.

"Let's see our new regulation. We have a comprehensive regulation right now, the Act no. 1/2009 that amended the old Act no.15/1992. I have been worked for more than 20 years, and I know how difficult to convince the legislator to issue an Act. But after the operating ban, the legislator supports the regulator to improve our air transport system; they issued the new Act which is more comprehensive, as recommended by the ICAO in USOAP 2007." (Muli, a government officer)

Other interviewees stated that the Indonesian political system affected the improvement in Indonesian air transport system.

"Our political system with separation of power contributes to corrective actions of the regulator to improve aviation safety. For example, the regulator cannot increase the amount of budgets for improving aviation because it has to be approved by the legislator. As we all know, the legislator also comes from multi-political parties, different backgrounds and, in my opinion, none of them are knowlegeable enough about the air transport system. So, if the legislator does not prioritise air transport, it may be caused by interests and unknowledgeable." (Hanung, an academic)

Another interviewee stated this issue cynically:

" The Indonesian regulator and legislator do not work together for the country, but tend to fight each other. They are too arrogant, so no wonder the EU banned all Indonesian airlines from flying to European countries." (Aman, a chief operational of an airline)

Some other interviewees highlighted the 'unhealthy relationships' between the operators, the regulator and even the legislature. For example, Agi (a public analyst and academic) defined the regulator as a 'mafia' group and untouchable. He also implied the power of the regulator helped them to cover any activities that benefitted themselves.

*"I fly often and I always monitor the condition of aircrafts that I fly in. I am scared and trying to avoid flying with some airlines. If I have a choice, I will not fly with those airlines because I really know how those airlines do maintaince to their aircrafts, such as C check, D check, et cetera. Likewise, the regulator seems like a 'Mafia' group and untouchable by anyone since they are the only institution that regulates our aviation. Thus, this is our aviation weakness because regulator has '**hanky panky**[19]' relationship with*

[19] *Hanky panky* is an idiom used to express trickery, deception, double dealing, or cheating.

*airlines. [Some] people in airlines more concerns with trading than providing service. This is another reason why airlines like '**warung tegal**[20]'. They think just to gain profit, and that is enough. So, that is why I said the regulator is a 'Mafia' group, because they maintain this relationship to gain individual benefits. The regulator will react to cover any issues that possible to affect this relationship."*

Furthermore, some interviewees addressed their criticms toward the legislator:

"People in aviation organizations do not know what the aviation is all about. Unknowledgeable people with low levels of safety sense will create lots of safety issues. This is even worse since the regulator is not able to regulate the organization because they gain personal benefit from their relationship with the operators. Additionally, we cannot deny there are some individuals in parliament who back up the operator. So, when safety is negotiated,...then, finally, boom..!!! An accident occurs and results in loss, either life or financial. This kind of power, I mean 'the relationship', influence the finding and the truth because these powerful people will cover the truth." (Odi, an academic and investigator)

Hence, the operating ban imposed by the European Union to all Indonesian airlines had improved the Indonesian aviation safety. However, the improvements seemed likely were not optimum due to barriers faced. Due to the complexity of the air transport system alike in Indonesia, it gives opportunities to people who were involved to commit actions for their own benefits. This was because the system was difficult to manage as a number of parts interacted and, as such, deviations often tended to be overlooked or undetected. At this point, an accident or incident was highly possible to occur since the deterioration processes already existed.

Figure 5.13 presents that 78% interviewees agreed failure to learn led to a series of accidents and incidents. Specifically, Figure 5.14 shows that none of the interviewees from the regulator agreed that failure to learn led to a series of incidents and accidents. This was quite different from the practitioners. Nine academics agreed that failure to learn was the cause of a series of events but two did not. Furthermore, eight academics that were also practitioners agreed there was a failure to learn while another two did not answer the question.

[20] *Warung tegal* is a food stall that provides economical types of foods.

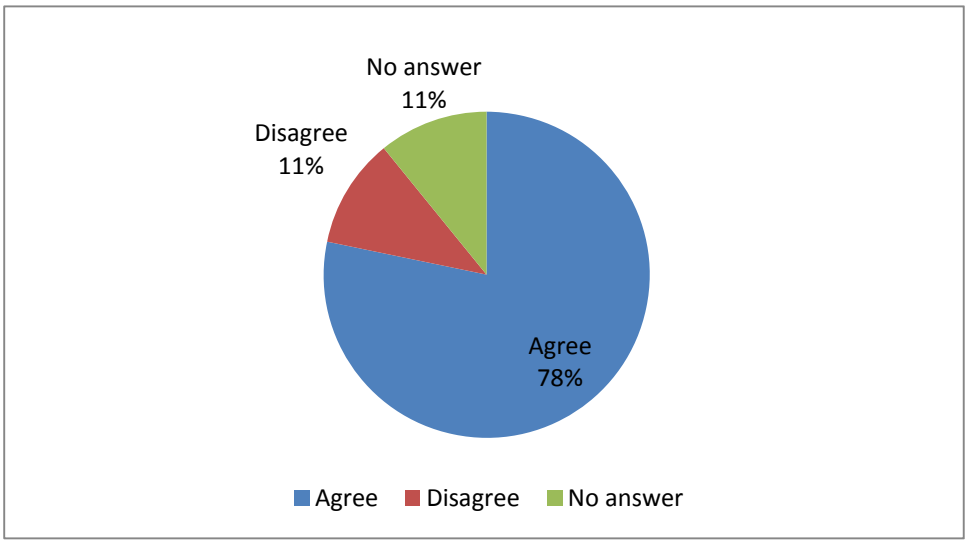


Figure 5.13 Failure to learn led to a series of incidents and accidents - responses

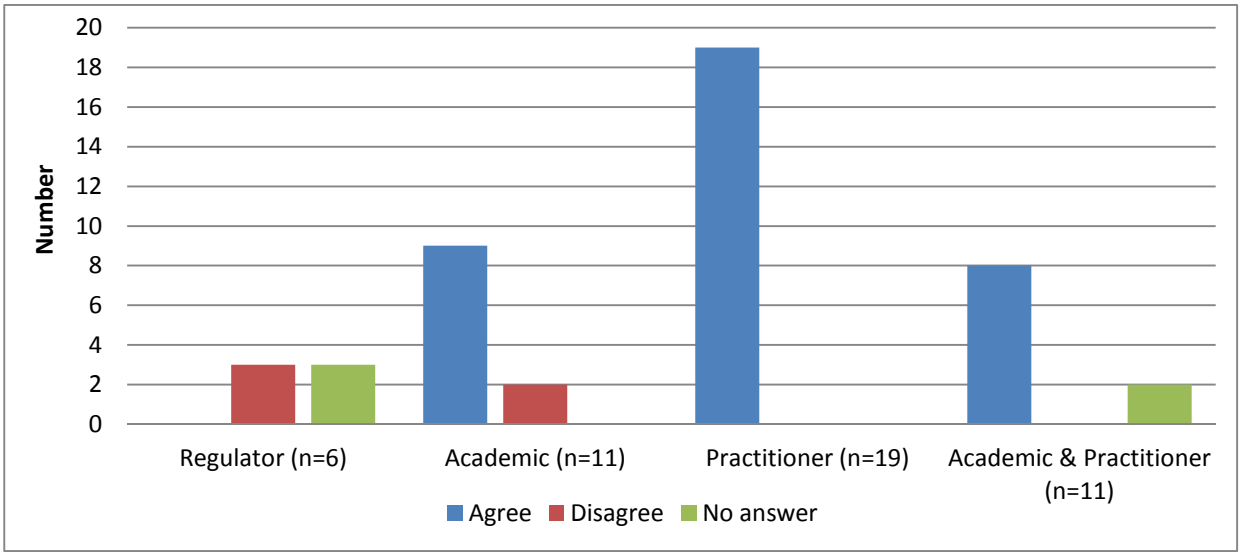


Figure 5.14 There was failure to learn that led to a series of incidents and accidents – interviewee groups

The regulator pointed to operators who were behind the series of accidents and incidents instead of identifying failure to learn as a cause:

> *"There was unhealthy competition after deregulation. We wanted to attract more airlines to enter and compete in the system, but they disobeyed the rules and regulations."* (Muli, a regulator officer)

> *"Many airliners do not know how to do aviation business. They think aviation is high profit business. They think only about money but forget to improve safety."* (Harun, a regulator officer)

Another interviewee also mentioned deviation of implementing regulations as the cause of a series of accidents and incidents:

> *"Deviation to implement the rules and the regulations are the main causes here."* (Novi, a regulator officer)

In contrast, practitioners clearly stated that the regulator was the cause of this phenomenon:

> *"...because the regulator never really,...really work to improve the system by learning from the previous events."* (Gyan, an aircraft engineer)

> *"I think our regulator fails to learn, so, they also fail to act. That is why there were recurrences."* (Dani, a CEO of an airline)

> *"No doubt there are recurrences. Those indicate that the system fails to learn and fails to implement corrective actions."* (Yono, a Chief of maintenance of an airline)

The interviews revealed that there were three agents in a series of accidents and incidents. The agents were the regulator, the operators and the existing system, as shown in Figure 5.15, below.

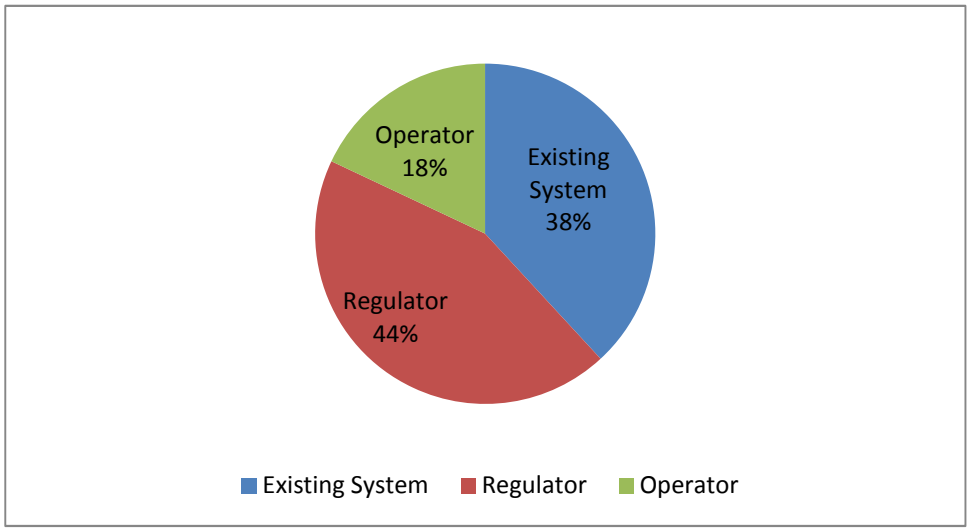


Figure 5.15 Causes for a series of incidents and accidents in the Indonesian air transport

The regulator was singled out as the main reason behind a series of accidents and incidents in the Indonesian air transport system. The practitioners addressed the cause of the series of events in Indonesian aviation to the regulator. Excluding the regulator, other interviewees also identified the regulator as the cause. The regulator exhibited a failure to learn and a failure to act, as stated by one interviewee.

> *"Here, I think the regulator fails to learn and also fails to act. Of course, there are other factors but these two factors are the main causes. If an accident occurred, the NTSC will conduct an investigation to determine causal factors and propose corrective actions in order to improve aviation safety. But the regulator actions are only until that stage, there is no follow up. We only work until we formulate conclusions to answer public concerns then we leave it and shift our attention to another case. There is no intention to learn and act from the regulator; everything just to fulfil their tasks."* (Ani, a CEO of an airline)

Some interviewees argued that the regulator failed to learn and failed to act as they viewed conducting an investigation after an accident or incident as a way to learn. However, the government did not act to implement the safety recommendations:

> *"We learn but fail to act. We act but the actions were not appropriate to solve the problems. We learn but we chose what we want to learn. I conclude that we just tried to improve anything that was effortless, but it seemed we did much. We rotated officers once an accident or incident occurred, but never improved the system. Hence, the same failures kept happening. We improved in the surface, but not solve the roots of the issues."* (Lase, an academic)

The operators were also implicated playing a significant role to cause an accident or incident to happen, as highlighted during the interviews. Some interviewees addressed that the cause was the condensed market after deregulation in 1999 that attracted new airlines to enter the Indonesian aviation market:

> *"Deregulation gave opportunities for new airlines to enter the aviation market, so, new entrants might establish a competitive market. But, some players committed to having 'unhealthy' activities at competing in a condensed market. For example, initial training was reduced to cut operational costs, and the maintenance cycle time was extended."* (Novi, a government officer)

Other interviewees stressed knowledge as an issue of the operators, as stated by Yoga (a consultant and academic):

> *"Many airlines have inadequate knowledge of aviation. Deregulations gave the opportunity for traders who have money, but no aviation knowledge to enter the market. Aviation was seen as a glamorous and prestigious business that involves lots of money. In fact, they forget that safety is costly and one of priorities in the aviation industry. So, the lack of knowledge led them to seek 'efficiencies' that often compromised safety."*

The weak and vulnerable system was stressed by some interviewees; for example:

> *"Our air transport system is weak and we have inadequate knowledge to improve it, we even do not recognise that our system is weak. So, that is why our transport system, in particular air transport, is vulnerable. We faced with many accidents and incidents but did not learn."* (Masya, an academic and retired pilot)

Another interviewee mentioned the system for other reasons:

> *"I will say that the accidents and incidents in Indonesia are caused by our weak and vulnerable system. This kind of system is established by low quality of resources that, unfortunately, also did not want to learn."* (Wahyu, a transport analyst and academic).

As stated by the interviewees, the vulnerability in the Indonesian air transport system was caused by the regulator, operators and the existing system. Therefore, these issues need to be concerned in order to improve the system.

5.5 Summary

This study revealed that the causes of accidents and incidents in the Indonesian air transport system were attributable to the deterioration of the system since its inception. There is verified by empirical evidence that human contributions were the root causes of the deficiencies. These deficiencies were related to knowledge, rules and enforcement. Furthermore, there were threats identified in the system. These threats (manipulation, bribery and collusion) occurred in the interactions of humans in the system. The combination of human deficiencies and threats were leading to the lower levels of performance in the system. Moreover, the interviewees stated that the poor performance in the system was also influenced by system perception and safety culture. Those multiple causalities worked together to weaken the system into the state of vulnerability, where it was easily attacked by unsafe acts or conditions to create an accident or incident.

The results of this study determined there were deficiencies which existed at the establishment stage, but tended to be ignored or overlooked thus while the system was running (the operational stage), these deficiencies were adapting to the system, but created holes in the system's defences. These 'earlier deficiencies' met, throughout time, with other deficiencies besides some threats that also arose, in unintended ways. Thus, the system was weakened and then an accident or incident occurs. Furthermore, the interrelated causes in the Indonesian aircraft accidents and incidents illustrate the complexity of how such a complex socio-technical system works.

The phenomena in the Indonesian air transport system reflect multiple-causalities of an accident or incident which is generated from a combination of cognitive, organizational, technical, socio-cultural, and elite's interests. These causes cannot be solved just from a single perspective; for example, by providing adequate training to maintain and improve knowledge or by issuing comprehensive rules and policies to guide the operations. No doubt that these

countermeasures help against poor performances, but they are not enough to improve the system safety as the system is dynamic while time will increase its complexities. Hence, constant and comprehensive assessments are essential to determine shortcomings or vulnerabilities in order to enhance safety.

However, the operating ban applied by the EU to all Indonesian airlines gave a positive impact to the system. There were significant improvements identified, which were contradictive with condition before the operating ban applied. There were four barriers to learn identified in this study: commitment and willingness, political system, covering issues and limited/poor intention to learn as indicated the improvements made just to fulfil the EU's requirements. Failure to learn was indicated by series of accidents and incidents in the system that was reasoned by the regulator, operator and the existing system.

Chapter 6
Discussion

6.1 Introduction

This chapter discusses the findings derived from the data collected with the existing theories. Four sections are presented. Section 6.2 discusses the causes of accidents and incidents in the Indonesian air transport system. Section 6.3 gives an explanation on high accident and incident rates that indicated failure to learn. Section 6.4 provides an insight of crisis happened in the Indonesian air transport system and, finally, section 6.5 summarises this chapter.

6.2 The Origin of Indonesian Commercial Aviation Accidents and Incidents

Understanding after-the-facts, accidents and incidents, should considered an aspect that was often overlooked by many scholars: 'historical aspect'. Thus, time played a significant role in this process. Considering this aspect provides better understanding on how values, beliefs and norms adopted by the system were developed. This study considered this aspect. The *raison d'etre* of this study was the operating ban applied to the Indonesian air transport system by the European Union. Therefore, the study traced back the system from the European Union operating ban until deregulation of the Indonesian air transport system in 1999 that was also the year of the establishment of the National Transport Safety Committee (NTSC) in Indonesia. In sum, this study analysed the Indonesian air transport system from 1999 to July 2007.

6.2.1 Incubation Period

Incubation period occurs before a system reaches its vulnerability stage. Analysing the time frame of this study provided knowledge on development processes of the system. According to it, the development processes were grouped into two periods: *the establishment period* and *the operational period*.

The establishment period was from 1999 to 2000. The period was started by an issuance of the Act N0.5/1999 on antimonopoly. The Act aimed to stimulate the Indonesian economic by giving opportunities of privatization in industries, including aviation. Following the Act, there were several Ministerial Decree (MD) issued; for example, MD No.77/2000 on requirements

for aviation operations, MD No.11/2001 on aviation operations. This period called as deregulation era that stimulated the Indonesian air transport system.

Ever since the deregulation, new airlines prepared to enter the Indonesian aviation market. In 2000, the new entrants entered the market and introduced a new system in aviation business: Low Cost Carrier (LCC); for example, Jatayu Airlines and Lion Air. However, the actors in aviation, especially the regulator, was not anticipated the fastest growth of the system. The regulator was not prepared well. There was no plan to improve resources; for example, the numbers of infrastructures, the numbers of inspectors. Therefore, the next period – the operational period – there were negative consequences happened as the results of lack of preparation.

The operational period was started from 2001 to July 2007, prior the announcement of the EU's operating ban. The operational stage refers to the period after the establishment era in which the system has developed (e.g., deregulation, privatisation). In this period, accidents and incidents followed the growth of the system. This study viewed these events as warning signals that tended to be overlooked and even ignored until international bodies such as ICAO and FAA recognized the problems and downgraded the Indonesian aviation safety rate. Finally, the European Union applied an operating ban to all Indonesian airlines.

Examining each stage has identified deficiencies in the system. These deficiencies were grouped into three groups: knowledge-based, rule-based, and enforcement-based deficiencies.

In the first period, the establishment period, there were two deficiencies identified. These deficiencies were *inadequate knowledge* that was related to knowledge-based deficiencies and *unclear rules* that was related to rule-based deficiencies. More deficiencies were identified in the second period. This might be caused by there were more activities in this period so the deficiencies led to visible negative consequences, in this case, incidents and accidents. The deficiencies in the second period were: knowledge-based deficiencies (inadequate knowledge, inadequate training, and not the right person in the right job), rule-based deficiencies (unclear rules, out-of-date rules, non-compliance with international rules, and no guidance), and enforcement-based deficiencies (no control, lack of sanction, and infirmness/resoluteness). These deficiencies are presented in Table 6.1, below. Each deficiency is discussed in Section 6.2.2.

Table 6.1 The deficiencies at the Indonesian air transport system

Resources	Establishment Stage	Operational Stage
Knowledge	Inadequate knowledge	Inadequate knowledge Inadequate training Not the right person in the right job
Rules	Unclear rules	Unclear rules Out-of-date rules Non-compliance with international rules No guidance
Enforcement		No control Lack of sanction Infirmness or irresoluteness

In referring to failure theories (e.g., Swiss Cheese Accident Causation Theory, Man-made Disaster Theory), there is a precondition stage called as incubation period (Turner, 1978; Turner & Pidgeon, 1997) or latent condition (Reason, 1990, 1997, 2008, 2009), in which unintended and complex interactions of contributory factors defeat safety system. The following section presents those deficiencies identified in the Indonesian air transport system that already existed since the establishment of the system.

6.2.2 Deficiencies in Incubation Period

The deficiencies determined in this study inseparable from human factors. The data collected identified that there was a tendency to blame someone or something in the Indonesian air transport system as causes of an accident or incident, which was called as 'Eureka parts' by Langewiesche (1998). Human error was one of causes of an accident or incident that often to be pointed. Here, this label – human error – was often used to blame people in the sharp-end level; for example, pilots, ATC controller. But according to this study, human factors were there in all levels, from the regulatory level down to operational level, or in other words, from the blunt-end level to the sharp-end level.

6.2.2.1 Knowledge-based Deficiencies

Three deficiencies related to knowledge were identified by this study. They were *inadequate knowledge, inadequate training,* and *not the right person in the right job*.

Inadequate knowledge refers to a condition in which someone has insufficient knowledge or incapable to handle specific tasks. This study revealed that there was no mechanism to attract qualified and competent people so there were improprieties in the recruitment system. This

condition affected people who had been recruited, often those people had not qualified enough to handle specific tasks; for example, ATC controller had no knowledge on reading radar thus he could not identify if there was something wrong in the radar, pilots who just graduated from flying school got positions as PIC in which need more knowledge gained from flying hours. Consequently, those people were vulnerable to any trigger that could lead them commit to err.

There was a significant relationship between non-existent mechanism to recruit competent and qualified people with inadequate knowledge. Recruitment system is very important and one of strategies to minimise human error. By proper recruitment only people who are least likely to make mistakes to enter the system (Wells & Rondrigues, 2003, p. 172).

Non-existent mechanisms for recruiting competent and capable people were also supported by highly condensed aviation markets like Indonesia's. The findings showed that there was resources and activities imbalance in the operations. For example, in the establishment period, there were only two officers in the DGCA headquarter who were responsible for crew licensing while there were insufficient numbers of pilots to operate 982 aircrafts. These numbers could not provide best services to check all pilots meet requirements or not. Non-existent mechanism for recruitment made the officers' works harder. Consequently, when the operators recruited some *abal-abal* pilots who were not qualified or competent enough, this issue was undetected. The condition reflected lack of awareness of the regulator to anticipate the growth of the system.

On the other hand, focusing just to recruit pilots reflected a lack of awareness by operators that aviation operations are not a single man show, but the work of aircrew teams. Polham and Fletcher (2010) found that the development of recruitment mechanisms in aviation initially focused on the selection of pilots rather than on other aviation personnel, which was reflected in the Indonesian air transport system. Anyone who works in a complex system, not only pilots, like air transport should have sufficient knowledge to cope with its complexities. However, recruitment issues are relatively new phenomenon (Polham & Fletcher, 2010), ideally, limited tolerance for errors should be a key requirement of recruitment and selection.

Deficiency in recruitment was combined with *inadequate training*. This deficiency refers to a condition in which people should get knowledge to help them to do their tasks, but they did not get the knowledge. Westrum and Adamski (Westrum & Adamski, 2010) state that knowledge is essential in aviation activities. It should be maintained and improved in various ways; for example, providing training and written documents. Training will provide knowledge for a

specific identifiable job (Polham & Fletcher, 2010). Thus, reducing the number of training sessions just for cost-efficiencies, in fact, risked the aviation operations, as reveaed in the Mandala Airlines MDL 493 case.

Training is also proposed by Wells and Rodrigues (Wells & Rondrigues, 2003, p. 172) as another strategy to reduce error and it is agreed by Ballesteros (2007). He stated that technological development has created a gap between necessary knowledge in an earlier phase of development and the latest knowledge that is needed in current situation. The gap has possibility to affect human performances in the system. This deficiency occurred at the operational period as the system was begun to grow.

However, the actors in the system did not realize that a recruitment and selection system work in conjunction with training – the more precise the recruitment and selection mechanism, the higher the level of qualified and competent persons that may be recruited. Consequently, in the long-run, it reduces training requirements.

The last deficiency related to knowledge was *not placing the right person in the right job*. At the establishment period, this deficiency was not founded, this might be caused the system was just begun. Following the growth of the system, more tasks need to be done and, at this time, this deficiency was identified. This deficiency refers to a condition in which a person fills a position that he/she has not competent and capable enough to handle the job. This was happened not only because ones had insufficient knowledge or even no knowledge about their new position, but often their knowledge insignificant to the position. Here, in the Indonesian air transport system, the condition occurred as a result of bureaucratic system. Seniority was often used as a reason for a decision to appoint to a position rather than expertise. So, the bureaucratic system often does not place the right people to the right job.

Two deficiencies, inadequate knowledge and training, were founded in either the regulatory or the operational level, but the last deficiency, not right person in the right job, was only founded in the regulatory level.

These deficiencies affected human performances to handle their tasks. These deficiencies supported Rasmussen (1982) and Reason (1997) study on human performances. They found that *knowledge-based performance* was often resulted from shortage of information or inadequate training to deal with a new task. This study revealed that limitation of knowledge was not only resulted from shortage of information or inadequate training, but it was started

from recruitment. Improper recruitment affected the quality of people who enter the system thus, in long run, will affect human performances in the system.

6.2.2.2 Rule-based Deficiencies

Four deficiencies identified in this study were related to rules. These deficiencies were *unclear rules, out-of-date rules, non-compliance with international rules,* and *no guidance*.

The first deficiency related to rules is *unclear rules*. This deficiency refers to ambiguity of rules because the rules could be interpreted in various ways. The Act no.15/1992 was issued to regulate the Indonesian air transport system in 76 verses. But, the Act only provided explanations of terms used in the system and framework of the system. There was a lack of comprehensive explanations of each term and the framework, neither in the Act, itself, nor in other regulations or policies that are lower than the Act. Consequently, at the operational period, there were multi-interpretations on the Act although the regulator issued several rules to provide more explanation.

The condition affected people in the operational level (the sharp-end level) because the blunt-end levels took any decision was depend their interpretation to the rules. As there were ambiguities on interpretation of meanings of the rules, the blunt-end levels tended to take a decision that had more benefits to them. For example, the applications of A, B, C Checks that could be negotiated as unclear explanations on the procedures. Furthermore, this study identified that the regulator did not communicate the rules effectively, even their officers often did not know well about the rules. Thus, the rules could not well regulate the Indonesian air transport system.

The second deficiency was *out-of-date rules*. So, this study, found that besides unclear rules, often these rules were *out-of-date*. Deficiencies were not only existed in the primary legislations, but also at the operational level; for example, there were often found accidents or incidents caused by out-of-date rules. Two cases, Mandala MDL 091 and Garuda Indonesia GA 200, evidenced similar problems – unrevised rules. The AEPs were not reviewed, updated and even practiced thus at the time of accidents affected the number of survivors. The existence of this issue showed that there was no established mechanism to periodically review existing rules so a need to update the rules could not be applied.

Non-compliance with international rules was the third deficiency identified by this study. International rules; for example, Annexes and CASRs issued by ICAO, US FAA policies, are periodically reviewed to determine a need to update the rules. The amendment will be issued

and distributed to the ICAO's contracting states and any countries that applied the FAA rules. However, the Indonesian air transport system often did not comply with these rules. The rules in the system often only considered about national interests but forgetting international standards. Consequently, at the operational period, activities in the system did not meet international standards; for example, numbers of inspectors for inspecting the aviation-related activities, the infrastructures of airports, the navigation systems.

The last deficiency in this group was *no rules*. This study revealed that at the operational period, sometimes there were no rules to guide the aviation-related activities. This deficiency led to uncertainties to people at the sharp-end levels. Those people faced with complexities, but had to take any actions, which there were no guidance. So, there was not a surprise if their decisions fail. Some rules cannot be written – known as tacit knowledge (Westrum & Adamski, 2010) – there were many rules that were supposed to be written but were not.

At the establishment period, the Indonesian air transport system only had an Act, the Act No.15/1992, which was not comprehensive enough to regulate the system. Therefore, at the operational period, there was lack of guidance because the regulator did not provide comprehensive rules and also did not periodically evaluate a need for updating the existing rules. These deficiencies might be resulted in people who make error or correct performances as were stated by Reason (1997). On the other hand, Rasmussen (1983) viewed errors in human performances that related to rules are often occurred in sophisticated activities with lots procedures, which were not happened in Indonesia as all deficiencies existed because lack of guidance.

6.2.2.3 Enforcement-based Deficiencies

Three deficiencies related to enforcement were revealed by this study. The deficiencies were *no control, lack of sanction,* and *infirmness or irresoluteness.* These deficiencies were only existed at the operational period.

In air transport system, there are complex interactions among parts so control is essential to manage errors, from engineering level (e.g., automation) until administrative level (e.g., procedures) (Wells & Rondrigues, 2003). Here, the regulator seemed did not do their job to control the aviation operations. Control refers to exercise restraining over procedures or policies so if there is loose control over the procedures or policies, any defect will not be anticipated and solved earlier. This study founded that *lack of control* existed as it resulted from a combination of shortages of resources and supervision. Thus, monitoring, cross checking or ensuring were

not properly applied; for example, the IRS issues founded at the Adam Air DHI 872 and DHI 574 cases which although the operator received reports of the recurring defects on the IRS, there was no action taken to resolve it while the lack of control of the regulator over the operator led to allowing the aircraft to be operated.

Referring to the Adam Air DHI 872 incident investigation report, there was a contribution of the IRS to the incident that caused the aircraft did not landing at its designated airport. However, there was no sanction applied to the airline although there were recurring defects on the IRS. The regulator did not apply any sanction because they did not know there were IRS defects. So, lack of control often worked in conjunction with lack of sanction. This deficiency was also caused by the regulator's attitude to easily 'forgive and forget'. Consequently, defects, errors, or violations passed *without sanctions or punishment* and it was not surprising that similar defects, errors or violations happened again, as in the Adam Air cases. Hence, applying sanctions or punishments to enforce the system, as suggested by Wells & Rodrigues (2003), was not well done in the Indonesian air transport system. This contention is also supported by the fact that many officers were working just to fulfil their job tasks without integrity. Therefore, as long as they did their tasks to satisfy their boss, they did not care whether what they did might affect safety or not. Thus, here, the officers concerns were more about avoiding any conflict and just let things go without getting involved. They need to secure their positions. Bureaucratic system and politics contributed to this practice because moving and replacing ones position was not hard to do by the top level people, especially those people who tended to disobey their orders.

This study also revealed there was a significant relationship between lack of sanction with the last deficiency that related to enforcement – *infirmness* or *irresoluteness.* This deficiency refers to a condition in which ones are unsure how to react or take an action over an issue. This study founded that the regulator often did not take any action over something; for example, in Adam Air DHI 574 case, the regulator decided to grounded the airline was only after pressure from public and media. Thus, there was a tendency that the regulator chose to whom sanctions or punishments applied.

In sum, deficiencies-based enforcement had relationships each other. One deficiency influenced the others. These deficiencies mainly existed in the regulatory level as their tasks had to regulate the system. Thus monitoring, evaluating, and managing the system are the regulator's responsibilities (Wells and Rodriquez, 2003). However, a shortage number of people,

bureaucratic system, lack of integrity, and attitude were a combination that created deficiencies in the system.

6.2.3 Threats in the System

There were complex interactions in the Indonesian air transport system. People who interacted with the system were founded influenced by threats that contributed to the degeneration of the system. There were three threats identified: *manipulation, bribery, and collusion.* These threats worked contributed to affect human performances in the system.

Manipulation is defined as achieving a purpose by making unfair or artful changes. For this kind of practice once it was started, it was often followed by the next practice, over and over again. It was likely a vicious cycle of breaking the rules. People practiced this threat founded the benefit gained from practicing it while they also needed to cover their previous actions. Consequently, they had no care if their actions would affect safety or lead to dangerous situation. For example, manipulation of cargo weight in the airport because the officers wanted to get some cash. This practice placed the aircraft in a dangerous situation because if the MTOW of the aircraft exceeded its limit, an accident or incident was possible to occur.

The threat, manipulation, was often inseparable from *bribery* - the bestowing of a benefit in order to unduly influence of action or decision. For example, at the operational period, the airlines needed more pilots to fly the aircrafts, but there were not enough pilots available. The cheap and fast way to solve this issue was by upgrading co-pilot to become a pilot. So, that was why there were *abal-abal* pilots in the system.

This study also revealed that this threat was often practiced for speeding up or smoothing procedures in the regulatory level. For example, *pelicin* or 'glossy money' was needed to speed up getting an Air Operator Certificate (AOC). This threat was practiced mostly at the operational period because the regulator wanted to attract new entrants to the Indonesian aviation market. Some people viewed these as an opportunity to gain benefit. They requested new airlines to pay some cash in order to get a license to start an operation. If they request was rejected, the procedures would be longer than usual although the airline filled all requirements. So, longer waiting period would lead to loss thus the airline would do the request.

The last threat was *collusion*. This threat refers to secret agreement or cooperation, which benefits particular parties. Similar to two threats above, collusion was practiced also to gain benefits. But, this practice benefited not only one side; it benefited all parties that committed to practice the threat. For example, arrangement for bidding on a project to allow particular party

to win in bidding processes. Here, the bidding committee and a bidder had cooperation to arrange the bidding processes so the bidder won the project. Through this arrangement both parties, committee and bidder, gained benefits.

Table 6.2 summarises the deficiencies existed in the Indonesian air transport system and also the direct and indirect drivers that caused the deficiencies existed. Those cause and effect relationships were influenced by threats in the system. There were three threats identified that contributed to the degeneration of the system. These threats controlled and steered the system from the decision making level to the operational level.

This study identified there were deficiencies related to knowledge, rule, and enforcement. There were direct and indirect drivers that caused these deficiencies occurred while there were also threats that interacted with these drivers. *Direct drivers* refer to the causes that were connected directly to the deficiencies. *Indirect drivers* were defined as the causes that were not directly connected to the causes and often hidden in the system.

Table 6.2 The causes of aircraft accidents and incidents in the Indonesian air transport system

Deficiency Factors	Drivers		Threats
	Direct	**Direct/Indirect**	
Enforcement-based deficiencies			
Lack of control	A shortage of resources	Cost-efficiencies	Manipulation Bribery Collusion
Lack of sanction/punishment	Attitudes (forgive and forget) Low integrity Legal system	Politics Self-security Bureaucratic system	
Infirmness/resoluteness			
Rule-based deficiencies			
Out of date rules/procedures		Lack of knowledge	Manipulation Bribery Collusion
Non-compliance with the International rules			
No guidance			
Unclear rules	Lack of communication		
Knowledge-based deficiencies			
Inadequate knowledge	Improper recruitment system	Imbalance in the growth of the aviation industry and the availability of human resources Bureaucratic system Political system	Manipulation Bribery Collusion
Inadequate training		Cost-efficiencies	
Not right person in the right job		Bureaucratic system Political system	

In this study, deficiencies were found throughout the whole system, from the blunt-ends level to the sharp-ends level. Those deficiencies were not only at the final stage where an unsafe act was committed, but also began at the decision-making level. This thesis identified some of organizational influence, at least with respect to the Indonesian air transport system from 1999 to 2007.

The summary of the deficiencies factors existed from the regulatory level to the operational level is presented in Table 6.3, below. All deficiencies existed in all levels, except for sanction or punishment. For this kind of deficiency, operators were more firm compare with the regulator. This might be caused by operators dealt directly with customers. If they failed to satisfy their customers then they could not survive in a condensed aviation market like Indonesia.

The present study has also identified how the deteriorating process affected human performance, which in the air transport system, like other complex socio-technical system, reflected the performances of skilled experts. I acknowledge, of course, that people have limitations to their capabilities and abilities. So there was a need to maintain and improve these limitations, which worked concurrently with the growth of technology. Hence, the deficiencies and threats led to lower levels of performance since the system was not 'aware' of the deficiencies caused by enforcement, rules and knowledge.

Those deficiencies and threats existed in the system and whether noticed or not, they adapted and integrated with the system (as presented in table 6.2). So, the system kept running with those notices and unnoticed failures, as said by Boin (2005) that how error often undetected as due of pervasive human tendencies to cope ill-structured problems, which here was the Indonesian air transport system. In the long-term, these practices became habits and then culture. Thus, it became common to deal with safety instead of dealing with risks. Safety then could be bargained for although with that bargain, risks were increased. Hence, this study revealed that the causes of accidents and incidents in the Indonesian air transport system were not as simply as revealed in the NTSC's investigation reports, but existed deeper in the system.

Table 6.3 The deficiencies and threats in the regulatory body and operators

Deficiency Factors	Actors		Threats
	Regulator	**Operators**	
Lack of control	√	√	Bribery, manipulation and collusion were identified at the regulatory body and operators. These practices existed in interactions of the regulator and operators.
Lack of sanction/punishment	√		
Infirmness/resoluteness	√	√	
Out of date rules/procedures	√	√	
Non-compliance with the International rules	√	√	
No guidance	√	√	
Unclear rules	√	√	
Inadequate knowledge	√	√	
Inadequate training	√	√	
Not right person in the right job	√	√	

The condition of the Indonesian air transport system was reflected in the multiple causalities of aircraft accidents and incidents that occurred from the regulatory level, the legislature level to the operational level. For example, inadequate knowledge of the legislature and the regulator caused them did not recognize the needs of a new legislation or regulation. A lack of legislation or regulation caused people at the sharp-end had to adapt with the complexities of the operations with limitations they have. However, people, naturally, have ability to cope with complexity (Rasmussen, 1986), thus people at the sharp-end will try to find best strategies to adapt with the condition (Woods et al., 2010). Consequently, sometimes their efforts to adapt with complexities are successful, but sometimes are fail that might lead to an accident or incident.

The results of this study determined there were deficiencies existed at the establishment stage, but tended to be ignored or overlooked thus while the system was running (the operational stage), these deficiencies were adapting and integrated to the system, but created holes in the system's defences. These 'earlier deficiencies' met, throughout time, with other deficiencies besides some threats that were also arose, in unintended ways. Thus, the system was weakened then an accident or incident occurred. In some ways, the results are strengthening the conceptualisation of the incubation period (Reason, 1990, 1997, 2008, 2009; Turner, 1978; Turner & Pidgeon, 1997), but a linear sequence of accident causation used in their original formulation does not clearly explain the reasons behind the system breakdown, particularly from the threats that arose in unintended ways, socio-cultural aspect (e.g., sungkan), and elite's power (e.g., political system). Although Toft & Reynolds (Toft & Reynolds, 1997) refined that there is a complex combination of technical, individual, group, organizational, social factors, and together with culture, affected assumptions and practices, the influences of elite's power remain unclear.

Furthermore, the interrelated causes in the Indonesian aircraft accidents and incidents illustrate the complexity of how a system works. Therefore, applying the theories of failure to examine Indonesian aviation might be suited, but, in fact, both NAT and HRT also cannot clearly explain the phenomena at the Indonesian air transport system. The existence of threats as products of interactions of people in the system, socio-cultural aspects, and a fact of thick nuance of political system seem unrevealed. Although Perrow (1984, 1986a; 1999) states politics' and power's influence to human errors, he does not explicitly explain the terms. Moreover, the terms of threats and socio-cultural remain conceal.

6.3 Failure to learning

This study departed from high a series of accidents and incidents, which was indicated by frequency of occurrences from 1999 to July 2007. Although studies showed there were no two events were the same, the frequency of the events and also the reasons behind the events indicated that the system had failed to prevent recurrences. There were reasons behind this failure and this study identified that there were contributions of all actors in the system, including the NTSC, to this failure as will be discussed, below.

6.3.1 The Analysis of an Event

Investigating an accident in a complex socio-technical system was not easy, each accident is unique: As stated by Reason (1997) an accident has its own very individual pattern of cause and effect. Thus, Reason (1997) proposed that researchers should conduct deep investigation into the common underlying structures and processes to find the right level of explanation. This had not been carried out in Indonesia.

In-depth investigation was not applied in Indonesia. The investigation was only done by the NTSC according to the ICAO Annex 13. The Committee was unable to investigate all events, accidents and incidents. Dependency of the Committee to Department of Transport created shortages of the NTSC resources either facilities (e.g., equipments, funds) or investigators. So, the condition affected the objectives of an investigation, to determine the probable causes and to recommend control measures (Wells & Rondrigues, 2003, p. 134).

Investigating an event, the NTSC prepared two reports: preliminary investigation report and final investigation report. The analysis applied in the report is started from an event backward to determine the causes of the event. This type of analysis is called, event-chain approach (Dien et al., 2012). The common method used by the NTSC to investigate an event was FTA that deductively analyse an event to identify causes that lead to that event.

This study also revealed that there was a tendency of an investigation to find the unsafe acts instead of considering latent failures. For example, with the Adam Air DHI 782 and DHI 574 cases, the NTSC determined the cockpit crew made wrong decisions because of the dysfunctional IRS and they had not received any training to deal with this kind of problem.

Although the investigation report the NTSC addressed the lack of control conducted by the regulator that resulted in the repetitive defects in the IRS, the NTSC did not reveal how the lack of control happened. This tendency has supported Langewieche (1998) argument that stated

how study on failure tends to seek 'eureka parts', the direct causes of an accident or incident happened.

This study founded that the investigation reports found the causes of accidents on pilot performance (an overly frequent finding), which strengthens support for the views of Reason (2009) and Dismuskes (2009) who found that studies of human errors often focused on pilot performances instead of other errors committed by other aviation personnel. Looking back on the cases in the Indonesian air transport system – for example the two Adam Air cases – clearly showed that people in the organizational and the regulatory levels tended to be overlooked. It was clear that investigations carried out by the NTSC that were supposed to change ill structured problems, by examining the system, failed to improve them into well-structured ones.

6.3.2 The Investigators

The Committee had lack of experts to conduct deeper analysis to an event. Analysing an event consumed time and funds, which these were issues in the NTSC body. Dependency of the committee to Department of Transport caused their budget was depended on the Department. Furthermore, the members of the NTSC were not sufficient while investigators worked in voluntary based. Consequently, a combination of resources (method, humans and funds) resulted in impossibility to investigate all events.

Lacking to investigate all events might be possible for the NTSC for not recognizing early warning signals as indicated by incidents. Thus, the potential hazards could not recognize earlier than preventive actions cannot be proposed. Hence, it seemed reasonable to assume that the investigation objectives were not optimally achieved since accidents and incidents kept occurring.

Furthermore, pressures to the NTSC by media and public were also very strong in Indonesia. Once an accident occurred in Indonesia, then media would wrote every single angle of the event and often with harshly comments.

Information about an event often revealed into the media or public, which that information was highly confidential. For example, the black box of the missing plan, Adam Air DHI 574, had been uploaded to YouTube and revealed to national media. The recorded was not to be disclosed and only could be accessed by few people such as investigators. In fact, people in Indonesia knew all conversation although the authority, the NTSC, stated the recorded was not the right data. Consequently, public opinion had been developed because people knew the result

of the event – a missing plane – and by hearing the black box data, people thought they knew exactly what was going on in that plane and questioned why the pilot took a decision that placed the aircraft and passengers in danger. At this point, people used their judgment because they knew the consequence, in fact, what they thought they knew might be different in the event.

This condition was often founded in the Indonesian air transport system as data was easily to be released to media and public. As a consequence, the NTSC worked with pressures from public, media, and even authorities, which might be possible for them not to reveal the truth and tended to follow public opinion. A combination all factors above put lots of pressures to analysts who worked in investigations.

6.3.3 Barriers to Learning

After an accident or incident occurred in Indonesia, there were lots of speculations of its causes. A statement from the regulator and operator often developed public opinion although a formal investigation did not yet conduct. Therefore, public opinion would be easily developed, especially if there were public figures who gave statements on the event.

The findings indicated that by forming public opinion after the event, the all truth behind an accident or incident would not be fully revealed although, later, the NTSC investigation determined the causes of the accident or incident.

The lack of willingness and commitment to enhance safety was identified in the Indonesian aviation. The actions taken by the regulator were often after there were pressures from public and media. Moreover, the recommendations proposed by the NTSC were often not implemented and almost no evaluation on the recommendations. The importance of commitment to improve safety was also mentioned by Reason (1997). He also highlighted the importance of competence and cognisance, which were largely absent at the regulatory level.

Nevertheless, other two barriers: the political system and covering issues, were implied by Perrow (1994), who suspected that there were power and interests that drove the elite (regulator) not to put safety first. These barriers seemed likely to drive the regulator to choose what they wanted to learn and how they wanted to act. Although there were some barriers to learning identified by scholars; for example, information difficulties, regulatory hypertrophy, while Sagan (1994), Turner and Pidgeon (1997), Perrow (1986a) and La Porte (1996) suspect there are power and interests behind failure to learn. In fact, this present study identified all barriers to learn are related to ‘elite’ matters (politics and the promotion of self-interests).

6.3.4 The Implementation of Lesson Learn

Studies on aviation accident only relied to the NTSC as an authorised organization to conduct investigation on aviation accidents and incidents. Thus, here, there were no monitoring and evaluation conducted by the regulator to examine the system. Safety recommendations proposed by the NTSC seemed adequate to answer safety issue if an accident or incident occurred. In fact, there was no single document informed that the regulator did monitoring and evaluating application of the recommendations. So, there was no benchmark that provided a picture if there was an improvement in the system after the safety recommendation had applied.

The problems of investigation on an accident or incident in the Indonesian air transport system were complex. If Perrow (1994) saw air transport as error-avoiding system, it seemed not likely in the Indonesian air transport system because it was most likely due to a combination of: problem of analysis, analysts, and implementation of lesson learn. The condition was also strengthened Perrow's statement of how power and interests led the elite to not put safety first (Perrow, 1994).

This study identified that the Indonesian air transport system was unable to learn from the past experience as indicated by the high accident and incident rate. The condition was not only because of the barriers identified by this study, but also the deficiencies existed in the system. The system was already vulnerable since the beginning therefore people inside the system had been integrated with those deficiencies. Thus, it is reasonable to conclude that people in the system did not recognize the deteriorating processes happened since the deficiencies existed had affected their perceptions and, of course, influence the development of safety culture. An accident or incident occurred did not see as a consequence of processes inside the system but as deviation of human performances.

Learning after an event is highly recommended by scholars (for example, Roberts, 1990; Perrow, 1984; Reason, 1997), but since the regulator seemed likely to take on learning solely to answer public concerns, then they lose the objectives of learning (again evidenced by frequency of accidents and incidents in aviation). These facts continuously occurred in the system, and the vulnerabilities were not detected because there were poor/limited intentions to learn from any event.

Referring to theories of failures and complexity theories, these scholars stated the importance of learning after an event. The HRT scholars propose to learning extensively from the experience of accidents, incidents and near misses (LaPorte, 1996; LaPorte & Consolini, 1991) and translating the lessons learnt into practices (Pidgeon, 1997) will improve the organization's

reliability. Thus, comprehensively and extensively learning reflect the organization awareness to unexpected, unwanted and any surprise in the future.

Here, examining the Indonesian air transport system and learning theories, there are different perspectives of learning. The learning theories establish concepts that lessons from an event do not prevent the system from failing or predict future hazard eventuation, but should improve a system's reliability, so countering the effects of future unplanned or unwanted events.

The system seemed to apply iconic learning (Boin et al., 2005), however, as the case of the Indonesian air transport system indicates, learning from an event may just be a 'list' to be ticked or a requirement to be fulfilled in order to answer public concerns, i.e., superficial or 'surface' learning. It is not alike *passive learning* – knowing something, but doing nothing (Toft & Reynolds, 1997); rather, the organization learned but with poor or limited intentions.

6.4 Indonesian Aviation: A Crisis

The previous sections clearly defined that the deficiencies in the Indonesian air transport system existed since the beginning of the system established. However, those deficiencies were integrated with the system and the interactions of people in the system created threats which were later also integrated to the system. Throughout the time, people inside the system became comfortable with those deficiencies and the threats practiced thus although there were accidents and incidents occurred, the system unseen those as warning signals of problems in the system. A combination of deficiencies and threats in the system developed perception and safety culture of people in the system. Furthermore, as there were barriers to learn existed in the system, investigations carried by the NSTC did not achieve their objectives. Consequently, the system worked with these deficiencies and threats inside the system which the condition had weakened the system and, throughout the time, it became vulnerable.

The condition prior to the operating ban was suit with the concept of preconditions (Pauchant & Mitroff, 1992; Shrivastava, Mitroff, Miller, & Miclani, 1988; Turner & Pidgeon, 1997). Thus, at the time of announcement of the operating ban by the EU, the Indonesian aviation was in shock as the announcement affected perceptions, values and beliefs of people on the Indonesian air transport system.

This study clearly determined the process of the development of crisis in the Indonesian air transport system. Here, there were interrelationship between deficiencies and threats, which also affected people to learn from the past.

A clear picture of the crisis process in the Indonesian air transport system is presented in Figure 6.1, below, and essentially summarises the whole study.

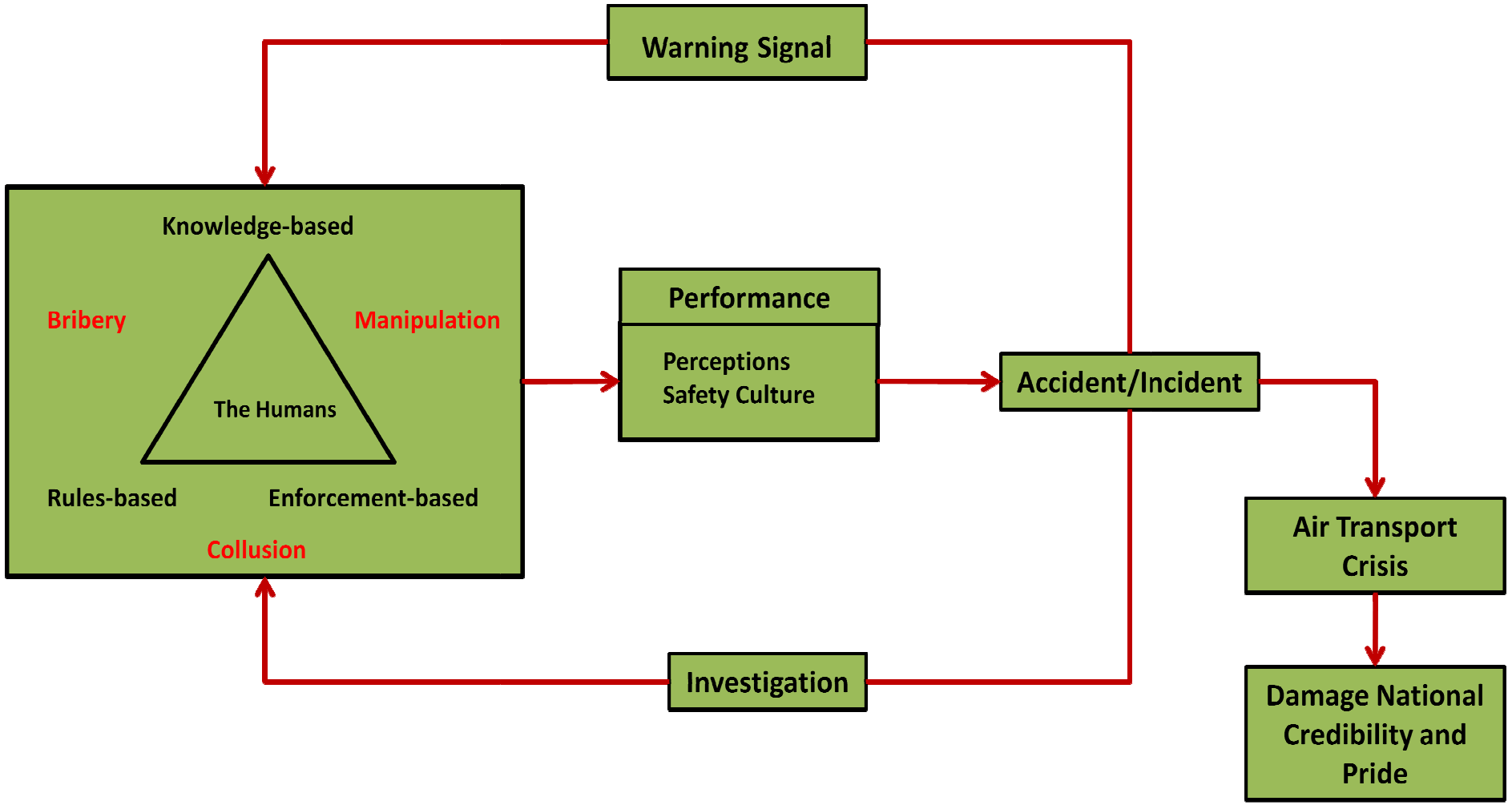


Figure 6.1 Crisis Process in the Indonesian Air Transport System

Figure 6.1 presents the Indonesian air transport system prior to the EU's operating ban applied to Indonesia. The system had been deteriorated by deficiencies related to knowledge, rule and enforcement which those deficiencies met threats (manipulation, bribery and collusion). A combination of the deficiencies and the threats affected people perceptions of matters related to aviation and at the same time was developed a safety culture. Here, there was a clear relationship of degradation process that was working in conjunction with the establishment of safety culture. The time was a very critical element here, since the process of development was not immediate but lengthy process until any elements was integrated into the system

Here, accidents and incidents in the system were not seen as warning signal thus people in the system seem likely not seeing the importance to implement safety recommendations proposed by the NTSC after there was an occurrence. It might be caused by the deficiencies and the threats existed in the system, which were also supported by barriers occurred that affected people to learn from the past. Thus, people tended not to do any actions in order to enhance safety. The condition was consistent with Uttal (1983) who state that values (what is important) and beliefs (how things work) will result in behavioural norms (the way we do things).

Consequently, throughout the time, the system had been weakened and it became vulnerable. As the accidents and incidents kept occurred in the system, the EU saw the condition as serious deficiencies all Indonesian airlines and the insufficient ability of the Indonesian authorities to perform its safety oversight responsibilities. Accordingly, the EU imposed all Indonesian airlines not to conduct commercial services to all European countries.

The operating ban was an event that shocked Indonesian aviation and damaged national pride and credibility. The process of deterioration occurred slowly, over the time, and was found likely to be more severe as values, beliefs and norms that had been practices were affected. Thus, it seemed reasonable to conclude that the Indonesian aviation crisis was not caused by a single accident or incident but an accumulation of accidents and incidents. The crisis was not acute, but chronic because of the system began to deteriorate even as it was established.

6.5 Summary

There were deficiencies occurred in the Indonesian air transport system since its establishment. Those deficiencies worked together with threats that appeared through interactions of people in the system. A combination of the deficiencies and the threats had affected performances in operations so accidents and incidents kept occurring, which later led the EU to impose all

Indonesian airlines not to conduct commercial services to all European countries. The announcement of the operating ban was a crisis event for the Indonesian aviation.

The operating ban applied by the EU to all certified airlines in Indonesia has given a positive impact to the Indonesian air transport system as were indicated by significant improvements identified, which were contradictive with condition before the operating ban as there were no significant improvements after an event. There were four barriers to learn identified in this study: commitment and willingness, political system, covering issues and limited/poor intention to learn as indicated the improvements made just to fulfil the EU's requirements. Failure to learn was indicated by series of accidents and incidents in the system that was reasoned by the regulator, operator and the existing system.

Chapter 7
Conclusions and Contributions

7.1 Introduction

This chapter discusses and concludes the findings derived from the data collected with the existing theories. Four sections are presented. Section 7.2 is revisiting the research objectives. Section 7.3 concludes this study. Section 7.4 presents implication of this study. Section 7.5 proposes recommendation from this study. Finally, Section 7.6 describes thoughts for future study.

7.2 Revisiting Research Objectives

The operating ban applied to all Indonesian airlines aroused my curiosity about the Indonesian air transport system. High accidents and incidents rate indicated the system was faced with problems that were not yet resolved and that, through time, this had led to a crisis. Prior studies on complex socio-technical systems (e.g., Perrow, 1984; La Porte, 1996; Robert, 1990) and aviation studies (e.g., Wiegmann & Schappel, 2003; Reason, 1997, 2000) did not consider enough about the importance of historical aspect, in this manner; - the aspect of time. Although analysis of a failure in a system such aviation would be started from that failure, there was no consensus on how far the analysis should be traced back. Consequently, some studies stopped when the causes of the failure were identified; but the root causes were there and seemed untouchable.

Prior studies analysed similar systems separately; for example, at micro-level (analysed only accidents and incidents) or meso-level (from accidents and incidents to organizations). However, there were limited studies that analysed the whole system such as the Indonesian air transport system.

The approach of this study was similar to Turner (1978; 1997) who analysed 84 accident and disaster reports in UK. This study was also related to Strauch (2004) who analysed the aviation from the human error perspective. But, both studies were not considered about ‘time’ and historical aspect. Therefore, this study added these aspects to provide comprehensive analysis in order to understand how accidents and incidents developed over time and deficiencies weakened a complex system.

This study was developed from the organizational learning and failure theories. While applying crisis theories was led by the assumptions that accidents and incidents in the system were warning signals of vulnerability in a system and also notified the presence of problems in the system (Fink, 1986). These signals or preconditions occurred during a period called incubation (Reason, 1997; Toft & Reynolds, 1997; Turner & Pidgeon, 1997), but tended to be overlooked or even ignored by the system. Subsequently, accidents and incidents kept occurring and, throughout the time, led to a crisis.

To enrich the data collected and capture more perspectives, discourse analysis was employed. Thus, various sources of data developed a step-by-step understanding of the Indonesian air transport system as there were many issues identified. Two fieldwork phases were conducted in order to obtain data. The first phase aimed to explore issues on the Indonesian air transport system and concurrently develop an initial model that was then used to guide the research. The second phase aimed to investigate the consistency of the findings derived from the first data collected and resulted in a final model.

7.2.1 Systemic Causes of Vulnerabilities in Indonesian Aviation

Chapter 6 presented evidence concerned with the incubation period in the Indonesian air transport system. At this period, there were deficiencies and threats that affected people performances in the Indonesian air transport system. The combination of deficiencies and threats had created poor performance and, trough the time, led to accidents and incidents.

In referring to failure theories (e.g., Swiss Cheese Accident Causation Theory, Man-made Disaster Theory), there is a precondition stage called as incubation period (Turner, 1978; Turner & Pidgeon, 1997) or latent condition (Reason, 1990, 1997, 2008, 2009), in which unintended and complex interactions of contributory factors defeat safety system. Both Reason's and Turner's theories developed their concepts from industrial safety improvements thus risk is viewed in terms of energy (Woods et al., 2010). Consequently, propagations of dangerous and unintended 'energy' transfers are needed to be controlled, contained or even stopped, which according to these theories by applying multiple layers of barriers.

The results of this study determined there were deficiencies existed at the establishment stage, but tended to be ignored or overlooked thus while the system was running (the operational stage), these deficiencies were adapting and integrated to the system, but created holes in the system's defences. These 'earlier deficiencies' met, throughout time, with other deficiencies

besides some threats that were also arose, in unintended ways. Thus, the system was weakened then an accident or incident occurred.

In some ways, the results are strengthening the conceptualisation of the incubation period (Reason, 1990, 1997, 2008, 2009; Turner, 1978; Turner & Pidgeon, 1997), but a linear sequence of accident causation used in their original formulation does not clearly explain the reasons behind the system breakdown, particularly from the threats that arose in unintended ways, socio-cultural aspect (e.g., sungkan), and elite's power (e.g., political system). Although Toft & Reynolds (Toft & Reynolds, 1997) refined that there is a complex combination of technical, individual, group, organizational, social factors, and together with culture, affected assumptions and practices, the influences of elite's power remain unclear.

Furthermore, the interrelated causes in the Indonesian aircraft accidents and incidents illustrate the complexity of how a system works. Therefore, applying the theories of failure to examine Indonesian aviation might be suited, but, in fact, both NAT and HRT also cannot clearly explain the phenomena at the Indonesian air transport system. The existence of threats as products of interactions of people in the system, socio-cultural aspects, and a fact of thick nuance of political system seem unrevealed. Although Perrow (1984, 1986a; 1999) states politics' and power's influence to human errors, he does not explicitly explain the terms. Moreover, the terms of threats and socio-cultural remain conceal.

7.2.2 Continuous Failure in Indonesia Aviation

Learning after an event is essential thus an investigation is conducted in order to determine probable causes and recommend control measures (Wells & Rodrigues, 2003, p.134). However, this study identified that there was a contribution of investigation to ability of the system to learn from the past. It was because the problems of investigation on an accident or incident in the Indonesian air transport system were complex. The complexities existed not only because of internal factors (e.g., lack of resources, dependency issue) and external factors (e.g., public and media pressures), but also the existence of deficiencies and threats in the system. So, it seemed reasonable to conclude that the investigations in the system did not achieve their objectives, which was proved by accidents and incidents kept occurring (as shown by frequency of accidents and incidents in 1999 – 2007).

Although there were recommendations proposed by the NTSC, there were no evidences that these recommendations were implemented. The condition implied that the regulator seemed to take on learning solely to answer public concerns. The actions taken by the regulator seemed

likely an 'iconic learning' (Boin et al, 2005), which the whole system worked together to implement corrective actions. In fact, learning from an event was only to answer public concerns and international requirements. So, learning was a fulfilment of requirements for answering all pressures. Therefore, it seems reasonable to assume that the regulator chose what they wanted to learn.

This study concluded that the recurrences of events were not because the regulator was failure to learn. The regulator learned but with poor or limited intentions; or the learning was only in particular spots. So, strategies to enhance safety by learning extensively from the experience of accidents, incidents and near misses (LaPorte, 1996; LaPorte & Consolini, 1991) and translating the lessons learnt into practices (Pidgeon, 1997) were not applied in Indonesia.

Furthermore, there are some barriers to learning identified by scholars; for example, information difficulties, regulatory hypertrophy, while Sagan (1994), Turner and Pidgeon (1997), Perrow (1986a) and La Porte (1996) suspect there are power and interests behind failure to learn. In fact, this present study identified all barriers to learn are related to 'elite' matters (politics and the promotion of self-interests).

7.3 Conclusion

The general aim of this study was to develop a logical explanation of the causes of accidents or incidents, a series of accidents or incidents and, organizational learning in an air transport system.

This study concluded that there were complex interactions of deficiencies and threats in the Indonesian air transport system that were ignored and overlooked. The period of these interactions weakened the system was an incubation period. In this period, the accidents and incidents kept occurring and were not seen as warning signals of problems in the system so it kept operation as usual.

By time, the system was weakened until a stage of vulnerabilities in which accidents and incidents frequency increased and, of course, the fatalities arose significantly. These conditions were recognized by international bodies (e.g., ICAO, FAA). So, that was why the operating ban was applied to all Indonesian airlines by the EU as a consequence of vulnerabilities of the system.

The announcement of the EU's ban on all certified Indonesian airlines was seen as a crisis event. The announcement was filled the criterion of crisis: the creation of fears, uncertainty, and

reputational risks (see Seeger et al., 2003; Seymour & Moore, 2000). Subsequently, this study investigated the process that occurred in the development of the crisis event.

This study revealed that the crisis in the Indonesian air transport system was not acute, but chronic because of the system began to deteriorate even as it was established. Thus, the impacts of the crisis were even more severe and affected all levels of the system, from the regulatory level, the operational level and, of course, the public. According to the results of this study, it seems reasonable to assume that the operating ban affected people's perceptions and beliefs of Indonesian aviation safety. But this assumption needs to be further examined since this study only examined preconditions or pre-crisis.

7.4 Implications of the Study

The phenomena in the Indonesian air transport system reflects multiple-causalities of an accident or incident in which generate from a combination of cognitive, organizational, technical, socio-culture, and elite's interests. The complexity of this system should be understood comprehensively so recommendations will solve not only problems in the surface but also problems that were rooted in the bottom.

Therefore, deficiencies that were identified by this study cannot be solved just from a single perspective; for example, providing adequate training to maintain and improve knowledge or issuing comprehensive rules and policies to guide the operations. No doubt that these countermeasures help against poor performances, but not enough to improve system safety as the system is dynamic while time will increase its complexities. Hence, constant and comprehensive assessments are essential to determine shortcomings or vulnerabilities in order to enhance safety.

There were academic and practical values determined by investigating the Indonesian air transport system. From the academic perspective, this study gave empirical evidence of: (1) the origin of the Indonesian aircraft accidents and incidents, (2) the deteriorating process in the Indonesian air transport system, and (3) how the vulnerability of a system, sooner or later, will led to a crisis.

Specifically, this present study contributes to accident studies, especially aviation studies. This study was started from the perspective that there were deficiencies in the Indonesian air transport system. Thus, this present study investigated the system for a period of ten years to identify the vulnerabilities. At this point, this study stresses the need to consider 'time' and

'historical aspects' to understand how a system is developed. These aspects need to be underscored since values, beliefs, and norms are developed by time.

This study identified a combination of the deficiencies and the threats arose in the Indonesian air transport system. The deficiencies were related to knowledge, rule and enforcement while the threats were manipulation, bribery and collusion. Although deficiencies related to knowledge and rule has been identified by prior studies in aviation, deficiencies related to enforcement remain unclear. Similarly, the threats and socio-cultural factors (e.g., *sungkan*) and elite's interests identified in this study provided new perspective on aviation causation studies. This study also reveals that there is a significant relationship between both factors that led them to conduct only '*spot learning'*.

However, the main contribution of this study is a model of crisis process in the Indonesian air transport system. The preconditions cycle prior to a crisis addresses new insight on crisis theories. This model can be extended or replicated to analyse organizational factors in other areas of study, in particular in Indonesia.

Practically, this study offers insight into policy makers' understanding of causes for the vulnerability in the Indonesian air transport system. This study provides a need to continuously examine the system in a period of time. This is necessary since a better understanding is essential to enhance aviation safety so recognition of the root causes will assist in formulating a more appropriate air transport policy. Hence, this study reflects that investigations of aircraft accidents cannot only examine the event but also include organizational, social, and historical perspectives so any hidden factors can be detected sooner.

7.5 Recommendations from the Study

This study showed multiple-causalities of aircraft accident, which is possible to be a crisis if these causes remain unsolved. Therefore, the following recommendations are proposed to the regulator, practitioners and academics.

Regulator

Specific recommendations to the regulator include: (1) improving the quality of human resources in the regulatory body, particularly, in the Department of Transportation; (2) reviewing existing aviation regulations; (3) strengthening enforcement of air transport regulations; and (4) improving development planning in the air transport system. Each recommendation is elaborated below.

First, the quality of human resources can be achieved through: (a) providing continuous trainings and workshops to the officers; (b) reviewing the bureaucratic system, place the right person to fill a position; (c) providing sufficient salary to the officers, particularly those who are working as inspectors and licensing officers; (d) establishing a safety culture in the regulatory body.

Second, reviewing aviation regulations is necessary since it was identified as one of causes of deficiencies in the system. Thus, it is necessary to: (a) collaborate with academics to review and examine the existing regulations; (b) develop a communication strategy with the legislative about the importance of aviation regulations to improve aviation safety.

Third, strengthening the enforcement of air transport regulations is essential but needs to be done at all levels, from the policy makers to the operational levels (e.g. inspection level, investigation level, licensing level). This can be achieved through: (a) socialising regulations through the media; (b) comprehensively developing coordination with practitioners and academics to eliminate ambiguity in the regulations; and (c) applying sanctions or punishment to any safety violations, but also rewarding any safety improvements to foster safety awareness, a climate of openness and encourage safety reporting.

Fourth, the regulator should design and plan the future development of the air transport system. Therefore, they should: (a) examine past and present conditions of the air transport system so weaknesses and strengths can be determined to improve future planning; and (b) intensively collaborate with international aviation bodies (e.g., ICAO, IATA) to improve system safety.

Practitioners and Academics

To develop a sustainable aviation safety culture there is a need for all actors to work together and collaborate. Therefore, practitioners and academics should also: (1) develop a safety culture by delivering knowledge on aviation safety; for example, publishing information on airlines' websites, providing information on board the airport, hosting seminars on aviation; (2) be involved in accident investigation by conducting the investigation together with the NTSC so the various perspectives will give new insights while also giving control over decisions; (3) ensuring that the regulations are enforced; for example, by encouraging safety reporting and developing an open culture, and (4) considering 'time' and 'historical aspects' to analyse the system.

7.6 Thoughts for Future Study

There are some thoughts addresses for future study:

First, the study of accident causation, especially air transport system, may include history and time into the analysis since this study identified how vulnerabilities of a system had developed over time. Prior studies in disasters; for example, Turner (1978; 1997) analysed 84 accidents and disasters in UK, he analysed only the reports. Toft (Turner's doctoral student) and Reynolds (1997), extended this type of analysis to include a wider body of data, which strengthened their findings, but they did not strictly account for time and history in their analysis. Thus, by considering more perspectives (e.g., socio-cultural, political) into accident causation studies will bring greater understanding of how an accident occurs.

Second, this study revealed hazards in the system that contributed to accidents and incidents in the Indonesian air transport system, but the data collected implicitly reflect there might be relationships between these and the elite's interests. Therefore, this phenomenon should be examined further and linked to organizational failure and learning studies.

Third, this study revealed perception and safety culture are also influenced the poor performances in the Indonesian air transport operations. Thus, these two aspects, perception and safety culture, also need to be investigated further from socio-cultural perspective since the data collected reflect how threats (e.g., bribery) and socio-aspect (e.g., *ruwat* for bad luck) influenced these aspects.

References

Adams, E. (1976). Accident causation and the management system. *Professional Safety, 21*(10), 26-29.

Aldrich, H. E. (2001). Who wants to be an Evolutionary Theorist?: Remarks on the occasion of the Year 2000 OMT Distinguished Scholarly Career Award Presentation. *Journal of Management Inquiry, 10*(2), 115-127.

Allnutt, M. (1976). *Human factors: Basic principles* (2nd ed.). StAlbans: Granada Publishing.

Argyris, C. and Schön, D. (1974) *Theory in practice: Increasing professional effectiveness*, San Francisco: Jossey-Bass

Argyris, C. (1976). *Increasing leadership effectiveness*. Willey. New York.

Argyris & Schön (1978). *Theory in Practice: Increasing professional effectiveness,* Jossey-Bass, San Fransisco, CA.

Ballesteros, J. S. A. (2007). *Improving Air Safety Through Organizational Learning: Consequences of a Technology-Led Model*: Ashgate Publishing.

Bateson, G. (1973). *Steps to an Ecology of Mind.* Palladin, London.

Barley, S. R. (2006). When I write my masterpiece: Thoughts on what makes a paper interesting *Academy of Management Journal, 49*(1), 16-20.

Blaikie, N. (2000). *Designing social research*. Cambridge: Polity.

Boeing Commercial Airplanes. (2007). *Statistical summary of commercial jet airplane accident: Worldwide operations 1959-2006*. Seattle.

Boeing Commercial Airplanes. (2010). *Statistical summary of commercial jet airplane accident: Worldwide operations 1962-2009.*Seattle.

Boin, A., Hart, P. t., Sterm, E., & Sundelius, B. (2005). *The politics of crisis management: Public leadership under Pressure*. New York: Cambridge University Press.

Buchanan, D. A., & Bryman, A. (2009). The organizational research context: Properties and implications. In D. A. Buchanan & A. Bryman (Eds.), *The SAGE handbook of organizational research methods* (pp. 1-18). Thousand Oaks, California: Sage Publications.

Busby, J. S. (2006). Failure to mobilize in Reliability-seeking Organizations: Two cases from the UK railway. *Journal of Management Studies, 43*(6), 1375-1393.

Caroll, J. (1995). Incident review in high-hazard industries: Sensemaking and learning. *Industrial and Environmental Crisis Quarterly, 9*, 175-198.

Chapanis, A. (1972). New approaches to safety in industry. *InComTec, London*.

Chia, R. (2000). Discourse analysis as organizational analysis. *Organization: A Debate on Discourse, 7*(3), 513-518.

Creswell, J. W. (2003). *Research design : qualitative, quantitative, and mixed methods approaches* (2nd ed.). California: Sage Publications.

Dambier, M., & Hinkelbein, J. (2006). Analysis of 2004 German general aviation aircraft accidents according to the HFACS model. *Air Medical Journal, 25*(6), 265-269.

Darling, J. R. (1994). Crisis management in international business: Keys to effect. *Leadership & Organization Development Journal, 15*(8), 3.

Dekker, S., Cilliers, P., & Hofmeyr, JH. (2011). The complexity of failure: Implications of complexity theory for safety investigations. *Safety Science,* Vol. 49, 939-945.

Department of Transportation. (2008, 23 January 2009). *Maskapai pertanyakan sikap Uni Eropa*. Retrieved 23 January 2009

Dien, Y., Dechy, N., & Guillaume, E., (2012). Accident Investigation: From searching direct causes to finding in-depth causes - Problem of analysis or/and analyst? *Safety Science,* Vol. 50, 1398-1407.

Dien, Y., Llory, M., 2002. *Première synthèse de la veille*, rapport interne EDF R&D.

Dien, Y., Llory, M., & Montmayeul, R. (2004). Organisational accidents investigation methodology and lessons learned. *Journal of Hazardous Materials, 111*(1-3), 147-153.

Dismukes, R. K. (Ed.). (2009). *Human error in aviation*. Surrey: Ashgate Publishing.

Easterby-Smith, M. & Lyles, M.A. (2011). *Handbook of organizational learning and knowledge management.* 2nd Ed. Wiley.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25-32.

Fink, S. (1986). *Crisis Management: Planning for the Inevitable*. New York: American Management Association.

Flood, R.L. & Romm, N.R.A. (1996) *Diversity Management: Triple Loop Learning*. Chicester, Wiley.

Gaur, D. (2005). Human Factors Analysis and Classification System applied to civil aircraft accidents in India. *Aviation, Space, and Environmental Medicine, 76*, 501-505.

Goldberg, M. H. (1984). *The blunder book*. New York: William Morrow & Co.

Grix, J. (2002). Introduction students to the generic terminology of social research. *Politics, 22*(3), 175-186.

Guba, E. G. (1990). The alternative paradigm dialog. In E. G. Guba (Ed.), *The paradigm dialog*: Sage Publications.

Gundel, S. (2005). Towards a New Typology of Crises. *Journal of Contingencies and Crisis Management, 12*(3), 106-115.

Halcomb, E. J., & Davidson, P. M. (2006). Is verbatim transcription of interview data always necessary? *Applied Nursing Research, 19*(1), 38-42.

Harms-Ringdahl, L. (2004). Relationships between accident investigations, risk analysis, and safety management. *Journal of Hazardous Materials, 111*(1-3), 13-19.

Hedberg, B. (1981). How organizations learn and unlearn? In P.C. Nystrom & W.H. Starbucks (Eds.) *Handbook of organizational design.* Oxford University Press. London. Page 8-27.

Heinrich, H. W. (1941). *Industrial accident prevention*. New York: McGraw-Hill.

Helmreich, R. (1990). *Human factors aspects of the Air Ontario crash at Dryden, Ontario*. Dryden: Minister of Supply and Services.

Hendrick, K., & Benner, L. (1987). *Investigating accidents with STEP*. New York: CRC Press.

Herrera, I.A., A. O. Nordekag, et al (2009). Aviation safety and maintenance under major organizational changes, investigating non-existing accidents. *Accident Analysis and Prevention* 41(6): 1155-1163.

Hood, C., & Jones, D. K. C. (1996). *Accident and Design: Contemporary debates in risk management*: Routledge.

IATA. (2008). *Annual Report 2008*: IATA.

International Standards and Recommended Practices Annex 13: Aircraft Accident and Incident Investigation, (2001).

Safety Management Manual (SMM), (2006).

ICAO. (2007a). *ICAO Universal Safety Oversight Audit Programme: Final report on the safety oversight audit of the Civil Aviation System of the Republic Indonesia*.

ICAO. (2007b). *Safety Oversight Audit Results under the Comprehensive Systems Approach: Indonesia*.

ICAO. (2009). *Transition of the Universal Safety Oversight Audit Programme to a Continuous Monitoring Approach, including the implementation of ICAO Coordinated Validation Missions.* Electronic Bulletin. 18 September 2009.

ICAO. (2010). *Comprehensive System Approach.* Reporting of audit results. 3rd Ed.

Janic, M. (2000). An assessment of risk and safety in civil aviation. *Journal of Air Transport Management, 6*(1), 43-50.

Janis, I. (1972). *Victims of groupthink: A psychological study of foreign decisions and fiascoes*. Boston: Houghton Mifflin.

Kirwan, B. (2001). Coping with accelerating socio-technical system. *Safety Science,* 37(2), 77-107.

Kolb, D. (1984). *Experiential learning*. New Jersey: Prentice-Hall.

Langewiesche, W., (1998). *Inside the sky: a Meditation of Flight.* Pantheon Books, New York.

Langley, A. (2009). Studying processes in and around organizations. In D. A. Buchanan & A. Bryman (Eds.), *The SAGE Handbook of organizational research methods*. London: Sage Publications.

LaPorte, T. (1996). High Reliability Organizations: Unlikely, Demanding and At Risk. *Journal of Contingencies and Crisis Management, 4*(2), 60-71.

LaPorte, T., & Consolini, P. (1991). Working in practice but not in theory: Theoretical challenges of High-Reliability Organizations. *Journal of Public Administration Research and Theory, 1*(1), 19-48.

LaPorte, T., & Rochlin, G. (1994). A rejoinder to Perrow. *Journal of Contingencies and Crisis Management, 2*(4).

Le Compte, M. D., & Schensul, J. J. (1999). *Analyzing and interpreting ethnographic data*. California: AltaMira Press.

Le Coze, J.-c. (2008). Disasters and organisations: From lessons learnt to theorising. *Safety Science, 46*(1), 132-149.

Li, W.-C., Harris, D., & Yu, C.-S. (2008). Routes to failure: Analysis of 41 civil aviation accidents from the Republic of China using the human factors analysis and classification system. *Accident Analysis & Prevention, 40*(2), 426-434.

Marais, K. (2005). *A new approach to risk analysis with a focus on organizational risk factors.* Unpublished Dissertation, Massachusetts Institute of Technology

Mason, J. (1996). *Qualitative researching* London: Sage Publishing

Meyers, G. C., & Holusha, J. (1986). *When it hits the fan: Managing the nine crises of business*. Boston: Houghton Mifflin.

Miles, R.H. (1982). *Coffin nails and corporate strategies.* Prentice-Hall, Englewoods Cliffs, NJ.

Minichiello, V. A., Timewell, R., & Alexander, L. (1990). *In-depth interviewing: Researching people*. Melbourne: Longman Cheshire.

Ministry of Transportation. (2008, June). *Transportation Statistics 2007*: Ministry of Transportation Republic of Indonesia.

Mintzberg, H. (1983). *Power in and around organizations / Henry Mintzberg. Subject(s): Power (Social sciences) Organization. Corporations*: Englewood Cliffs N.J. : Prentice-Hall

Mitroff, I. I., Pauchant, T., Finney, M., & Pearson, C. (1989). Do (some) organizations cause their own crises? The cultural profiles of crisis-prone vs. crisis-prepared organizations. *Organization Environment, 3*(4), 269-283.

Mitroff, I. I., Pearson, C. M., & Harrington, L. K. (1996). *The essential guide to managing corporate crisis: A atep-by-step handbook for surviving major catastrophes*. Oxford: Oxford University Press.

Mitroff, I. I., Shrivastava, P., & Udwadia, F. E. (1987). Effective crisis management. *The Academy of Management Executive, 1*(4), 283-292.

Netjasov, F., & Janic, M. (2008). A review of research on risk and safety modelling in civil aviation. *Journal of Air Transport Management, 14*, 213-220.

O'Hare, D. (2000). The 'Wheel of Misfortune': a taxonomic approach to human factors in accident investigation and analysis in aviation and other complex systems. *Ergonomics, 43*(12), 2001 - 2019.

Owen, D. (1998). *Air Accident Investigations: How science is making flying safer*: Patrick Stephens Limited.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3 ed.): Thousand Oaks Calif. : Sage Publications

Pauchant, T. C., & Mitroff, I. I. (1992). *Transforming the crisis-prone organization*. San Fransisco: Jossey-Bass.

Pearson, C. M., & Clair, J. A. (1998). Reframing crisis management. *Academy of Management Review, 23*(1), 59-76.

Pearson, C. M., & Mitroff, I. I. (1993). From crisis prone to crisis prepared: A framework for crisis management. *The Executive, 7(1), 48*.

Perrow, C. (1984). *Normal accidents: Living with high-risk technology*: Basic Books.

Perrow, C. (1986a). *Complex organizations : a critical essay* (3rd ed.). New York Random House.

Perrow, C. (1986b). *Complex Organizations: A Critical Essay*: McGraw-Hill.

Perrow, C. (1994). The Limits of Safety: The enhancement of a theory of accidents. *Journal of Contingencies and Crisis Management, Vol 2, No.4*(December 1994).

Perrow, C. (1999). *Normal Accidents: Living with high-risk technologies* (2nd ed.). Princeton: Princeton University Press.

Perrow, C. (1999). Organizing to reduce the vulnerabilities of complexity. *Journal of Contingencies and Crisis Management, 7*(3), 150-155.

Peters, G. (1966). Human error: analysis and control. *Journal of the ASSE*.

Pettigrew, A. M. (1997). What is a proccessual analysis? *Scandinavian Journal of Management, 13*(4), 337-348.

Phillips, N., & Hardy, C. (2002). *Discourse analysis: investigating processes of social construction* (2nd ed.). Thousand Oaks: Sage Publications.

Pidgeon, N. (1997). The Limits to safety? culture, politics, learning and man–made disasters. *Journal of Contingencies and Crisis Management, Volume 5* (Issue 1), 1 - 14.

Pidgeon, N., & O'Leary, M. (2000). Man-made disasters: why technology and organizations (sometimes) fail. *Safety Science, 34*(1-3), 15-30.

Polham, D. L., & Fletcher, J. D. (2010). Personnel selection and training. In J. A. Wise, V. D. Hopkin & D. J. Garland (Eds.), *Handbook of Aviation Human Factors* (2nd ed.). Boca Raton: CRC Press.

Putnam, L. L., & Fairhurst, G. T. (2001). Discourse analysis in organizations: Issues and concerns. In F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication: advances in theory, research, and methods*: Sage Publications.

Quarantelli, E. L. (1982). What is a Disaster? In B. Jones & M. Tomazevic (Eds.), *Social and Economic Aspects of Earthquake*. New York: Cornell University.

Quarantelli, E. L. (1985). *Organizational behavior at the emergency time periods of disasters*. New York: Cornell University.

Quarantelli, E. L. (1988). Disaster crisis management: A summary of research findings. *Journal of Management Studies, 25*(4).

Rasmussen, J. (1982). Human errors. A taxonomy for describing human malfunction in industrial installations. *Journal of Occupational Accidents, 4*(2-4), 311-333.

Rasmussen, J. (1983). Skills, Rules, and Knowledge: Signals, Signs, and Symbols, and Other Distinctions in Human Performance Models. *IEEE Transaction on System, Man and Cybernetics, 13*(3), 257-266.

Rasmussen, J. (1986). *Information processing and human-machine interaction: An approach to cognitive engineering*. New York: North-Holland.

Rasmussen, J., & Pedersen, O. M. (1984). *Human Factors in probabilistic risk analysis and in risk management* Paper presented at the International Symposium on Operational Safety of Nuclear Power Plants Vienna.

Ray, S. J. (1999). *Strategic communication in crisis management: Lessons from the airline industry*. New York: Greenwood Publishing Group.

Reason, J. (1990). *Human error*. Cambridge England New York: Cambridge University Press.

Reason, J. (1997). *Managing the risks of organizational accidents*. Aldershot, Hants, England Brookfield, Vt., USA: Ashgate.

Reason, J. (2000). Human error: models and management. *BMJ, 320*(7237), 768-770.

Reason, J. (2008). *The human contribution: Unsafe acts, accidents and heroic recoveries*. Surrey: Ashgate Publishing

Reason, J. (2009). The contribution of latent human failures to the breakdown of complex systems. In E. Salas (Series Ed.), R. K. Dismukes (Ed.), *Human error in aviation* (pp. 5-14). Surrey: Ashgate Publishing. (1990)

Richards, L. (2005). *Handling qualitative data: A practical guide*: Sage Publications

Rijpma, J. A. (1997). Complexity, Tight-Coupling and Reliability: Connecting Normal Accidents Theory and High Reliability Theory. *Journal of Contingencies and Crisis Management, 5*(1), 15-23.

Roberts, K. (1990a). Managing High Reliability Organizations. *California Management Review, 32(4)*, 101.

Roberts, K. (1990b). Some characteristics of one type of High Reliability Organization. *Organization Science, 1*(2), 160-176.

Roberts, K., Bea, R., & Bartles, D. L. (2001). Must accidents happen? Lessons from High-Reliability Organizations. *Executive, 15*(3), 70-79.

Rochlin, G. I. (1996). Reliable Organizations: Present research and future directions. *Journal of Contingencies and Crisis Management, 4*(2), 55-59.

Roelen, A. L. C., P. H. Lin, et al (2011). Accident models and organisational factors in air transport: The need for multi-method models. *Safety Science*, 49(1): 5-10.

Rynes, S., & Gephart, R. P. (2004). From the Editors: Qualitative research and the "Academy of Management Journal". *The Academy of Management Journal, 47*(4), 454-462.

Sagan, S. D. (1993). *The limits of safety: Organizations, accidents, and nuclear weapons*: Princeton University Press.

Sagan, S. D. (1994). Toward a political theory of organizational reliability. *Journal of Contingencies and Crisis Management, Vol. 2, No.4*(December 1994), 228-240.

Schulman, P. R. (1993). The negotiated order of organizational reliability. *Administration & Society, 25*(3), 353-372.

Seeger, M. W., Sellnow, T. L., & Ulmer, R. R. (2003). *Communication and organizational crisis* New York: Greenwood Publishing Group.

Senders, J. W., & Moray, N. P. (1991). *Human error: Cause, prediction, and reduction*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Seymour, M., & Moore, S. (2000). *Effective crisis management : worldwide principles and practice*. London: Cassell

Shaluf, I. M., Ahmadun, F. l.-r., & Said, A. M. (2003). A review of disaster and crisis. *Disaster Prevention and Management, 12*(1), 24-32.

Shrivastava, Mitroff, I. I., Miller, D., & Miclani, A. (1988). Understanding industrial crises *Journal of Management Studies, 25*(4), 285-303.

Shrivastava, P. (1983). A typology of organizational learning systems. *Journal of Management Studies, 20*(1), 7-28.

Shrivastava, S., Sonpar, K., & Pazzaglia, F. (2009). Normal Accident Theory versus High Reliability Theory: A resolution and call for an open systems view of accidents. *Human Relations, 62*(9), 1357-1390.

Smart, K. (2004). Credible investigation of air accidents. *Journal of Hazardous Materials, 111*(1-3), 111-114.

Snell, R. & Man-Kuen Chak, A. (1998). The learning organization: Learning and empowerment for whom? *Management Learning*, Vol. 29, 337-64

Snook, S. A. (2000). *Friendly Fire: The Accidental Shootdown of US Black Hawks Over Northern Iraq*: Princeton University Press.

Stead, E. & Smallman, C. (1999). Understanding business failure: Learning and un-learning from industrial crises. *Journal of Contingencies and Crisis Management,* 7(1), 1-18.

Strauch, B. (2004). *Investigating human error: Incidents, accidents, and complex system*. Aldershot: Ashgate Publishing.

Strauss, A. L., & Corbin, J. M. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*: Sage Publications

Tarn, J. M., Wen, H. J., & Stephen, C. S. (2008). A theoretical perspective of man-made system disasters: Social-technical analysis and design. *Disaster Prevention and Management, 17*(2), 256 - 280.

Teperi, A.M. and A. Leppanen (2011). Managers' conceptions regarding human factors in air traffic management and in airport operations. *Safety Sciences*, 49(3): 438-449.

The Royal Society. (1992). *Risk: Analysis, perception and management*. London: The Royal Society.

Toft, B., & Reynolds, S. (1997). *Learning from disasters : a management approach* (Third ed.). Leicester England: Perpetuity Press.

Tsang, E. (1997). Organizational learning and the learning organization: a dichotomy between descriptive and prescriptive research, *Human Relations*, 50(1): 57-70.

Turner, B. (1978). *Man-Made Disaster* London: Heinemann.

Turner, B., & Pidgeon, N. (1997). *Man-made disasters: The failure of foresight*: London: Buttleworth–Heinemann.

Uttal, B. (1983). The corporate culture vultures. (corporate image). *Fortune, v108*, p66(66).

Van de Ven, A. H. (2007). *Engaged scholarship : a guide for organizational and social research*. Oxford ; New York: Oxford University Press.

Vaughan, D. (1992). Theory elaboration: the heuristic of case analysis. In C. Ragin & H. Becker (Eds.), *What is a case? Exploring the foundation of social enquiry*. New York: Cambridge University.

Vaughan, D. (1996). *The Challenger launch decision: Risky technology, culture, and deviance at NASA*: University of Chicago Press.

Vaughan, D. (1999). The Dark Side of Organizations: Mistake, Misconduct, and Disaster. *Annual Review of Sociology, 25*(1), 271-305.

Vaughan, D. (2004). Theorizing disaster: Analogy, historical ethnography, and the Challenger accident ethnography. *Ethnography, 5 (3)*, 315-347.

Vicente, K. J. (1999). *Cognitive Work Analysis: Toward Safe, Productive, and Healthy Computer-Based Work*. Mahwah, NJ: Erlbaum and Associates

Weaver, D. (1971). Symptoms of operational error. *Professional Safety, 104*(2), 39-42.

Weick, K. E. (1987). Organizational culture as a source of high reliability. *California Management Review, 29*(2), 112-127.

Wells, A. T. (1997). *Commercial aviation safety* (2nd ed.): McGraw-Hill.

Wells, A. T., & Rondrigues, C. C. (2003). *Commercial aviation safety* (4th ed.): McGraw-Hill

Westrum, R., & Adamski, A. J. (2010). Organizational factors associated with safety and mission success in aviation environments. In J. A. Wise, V. D. Hopkin & D. J. Garland (Eds.), *Hanbook of aviation human factors* (2nd ed.). Boca Raton: CRC Press.

Wetherell, M., Taylor, S., & Yates, S. J. (2001). *Discourse theory and practice : a reader* London: SAGE Publications.

Wiegmann, D., Neil, J. S., & Paul, B. B. (2001). Psychology of aviation safety. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 1019-1023). Oxford: Pergamon.

Wiegmann, D., & Schappell, S. A. (2003). *A human error approach to aviation accident analysis: The Human Factors Analysis and Classification System*: Ashgate Publishing.

Wiradipradja, S. (2001). Peraturan Perundang-undangan Penerbangan Nasional perlukah dItinjau kembali? In Purwono, L. Irahali & H. Djarab (Eds.), *25 tahun Dirgantara Indonesia*. Bandung: PT. Dirgantara Indonesia.

Wood, L. A., & Kroger, R. O. (2000). *Doing discourse analysis: Methods for studying action in talk and text*. Thousands Oaks: Sage Publications.

Woods, D. D., Dekker, S., Cook, R., Johannesen, L., & Sarter, N. (2010). *Behind human error* (2nd ed.). Surrey: Ashgate Publishing

Yin, R. K. (2003). *Case study research: Design and methods*: Sage Publications

Appendix A

Selected Primary Legislation on Aviation

No	Indonesian Legislations on Aviation	Contents
1	Regulation on Aviation 1932 (*Luchtvervoer-besluit*) was issued by Dutch government on 13th February 1933. It had been revised by *Staatsblad* No.118/1933.	The regulation provided general framework in Indonesian air transport.
2	Ordinance on Aviation 1934 (*Luchtvervoer-ordonnantie*) was issued by Dutch government in 1934. It had beed revised by *Staatsblad* No.2005/1934 and *Staatsblad* No.36/1942).	The ordinance provided framework in air transport operations.
3	Ordinance No.100/1939 (*Luchtvervoer-ordonnantie*) was issued on 1st May 1939 by Dutch government.	The ordinance provided framework for air transport activities in Indonesia. It has five sections and forty verses that regulated the air transport system.
4	Act No.83/1958 on aviation was issued on 27th December 1958. The Act was the first legislation in aviation after the Indonesian independence day.	The Act replaced *Luchtvervoer-besluit* 1934 and *Luchvervoer-ordonnantie* 1934. It consists of eight sections and twenty eight verses that provide general framework for air transport activities in Indonesia.
5	Act No.52/1992 on aviation was issued on 25th May 1992 and in conjunction with the Explanation of the Act.	The Act replaced the Act No.83/1983. It has 15 sections and 76 verses that provided more detail to regulate the Indonesian air transport system. The Act also provides definitions of terms used in the Indonesian air transport system, vision and mission, the Indonesian airspace territory, registration of an aircraft, airport, environmental impact, investigation and criminal court.
6	Government Regulation No.40/1995 on air transport. It was issued on 17th November 1995 and in conjunction with the Explanation of the Law.	The regulation was aimed to provide more detail of the Act No.15/1992. It has 10 sections and 49 verses. The regulation aimed to provide operational guidelines for commercial airlines. It gives explanation in detail, for examples: an airline definition, an airline registration and airline operations, routes and hubs. There are explanations on licensing requirements, sanctions, tariff, responsibilities and special services for disabled customers.
7	Government Regulation No.3/2000 on aviation. It was issued on 28th January 2000.	The regulation amended the Government Regulation No.40/1995. It amended verse 6(2) about representative of a foreign airline in Indonesia. The regulation has only two verses.
8	Government Regulation No.12/2000 on Search and Rescue was issued on 23rd February 2000.	The regulation provides search and rescue operations for an accident or incident in air transport or water transport. The regulation has six sections and 21 verses.
9	Government Regulation No.3/2001 on aviation safety and security. It was issued on 5th February 2001 and in conjunction with the Explanation of the Law.	The regulation provides framework for aviation safety and security, for example; definition of terms related to aviation safety and security, accident investigation and sanctions. The regulation has fourteen sections and one hundred and four verses.

10	Presidential Decree No.3/2007 on establishment of the National Committee of Evaluation of Transport Safety and Security. It was issued on 11th January 2007.	The Decree was issued to investigate high accident and incident rate in all transport modes during the last five years. Therefore, the government formed a national committee to investigate the Indonesian transport system comprehensively including regulations, transport safety standards and procedures. The objective was to determine the problems and propose recommendation to improve safety and security in all transport modes in Indonesia.
11	Presidential Decree No.16/2007 on extension of working period of the National Committee of Evaluation of Transport Safety and Security. It was issued on 3rd August 2007.	The Decree No.3/2007 stated that the working duration of the committee was for three months from the issuance date. The Decree No.16/2007 extended the working duration of the committee from 11th April to 11th October 2007 or for another six months. The extension was needed to provide longer time to conduct in-depth investigation.
12	Ministerial Decree No.1/2004 on reporting accident, incident or delaying of aircraft and aircraft accident/incident investigation procedures. It was issued on 13th January 2004.	The Decree provides explanation related to an aircraft accident, incident or flight delay. The Decree has five sections: definitions, notification the event, protecting any items related to the event, reporting the event and investigating procedures.
13	Ministerial Decree No.46/2004 on the NTSC organization and structure	The Decree stated the establishment of new units in the NTSC organizations. It has five sections and nineteen verses. The new unit, the Secretariat of the NTSC, has three sub-units: secretariat, research and investigation, and information and external affairs.

Appendix B

An Example of Written Evidence Coding

APPENDIX 1-2-03
FINDINGS AND RECOMMENDATIONS RELATED TO
CIVIL AVIATION ORGANIZATION

Auditee: **INDONESIA**	**ORG/03** 2.053; 2.103;
Audit Period: 06/02/2007 - 15/02/2007	

DOCUMENT REFERENCE:

Refer to Doc 9735, Appendix F for the document reference(s) associated with the protocol questions identified in this finding.

CE-1	CE-2	CE-3 X	CE-4	CE-5	CE-6	CE-7	CE-8

FINDING:

Indonesia has not established a mechanism to attract and retain qualified and experienced technical staff to enable it to meet its national and international obligations on civil aviation safety oversight.

RECOMMENDATION:

In order to meet its national and international obligations on civil aviation safety oversight, Indonesia should establish a system to attract and retain the necessary human resources.

CORRECTIVE ACTION PLAN PROPOSED BY THE STATE:

Corrective action plan submitted by the State is found at Appendix 3-2-3 of this report.

Estimated Implementation Date: 31/12/2009

COMMENTS BY ICAO:

The corrective action plan submitted by the State fully addresses this ICAO finding and recommendation.

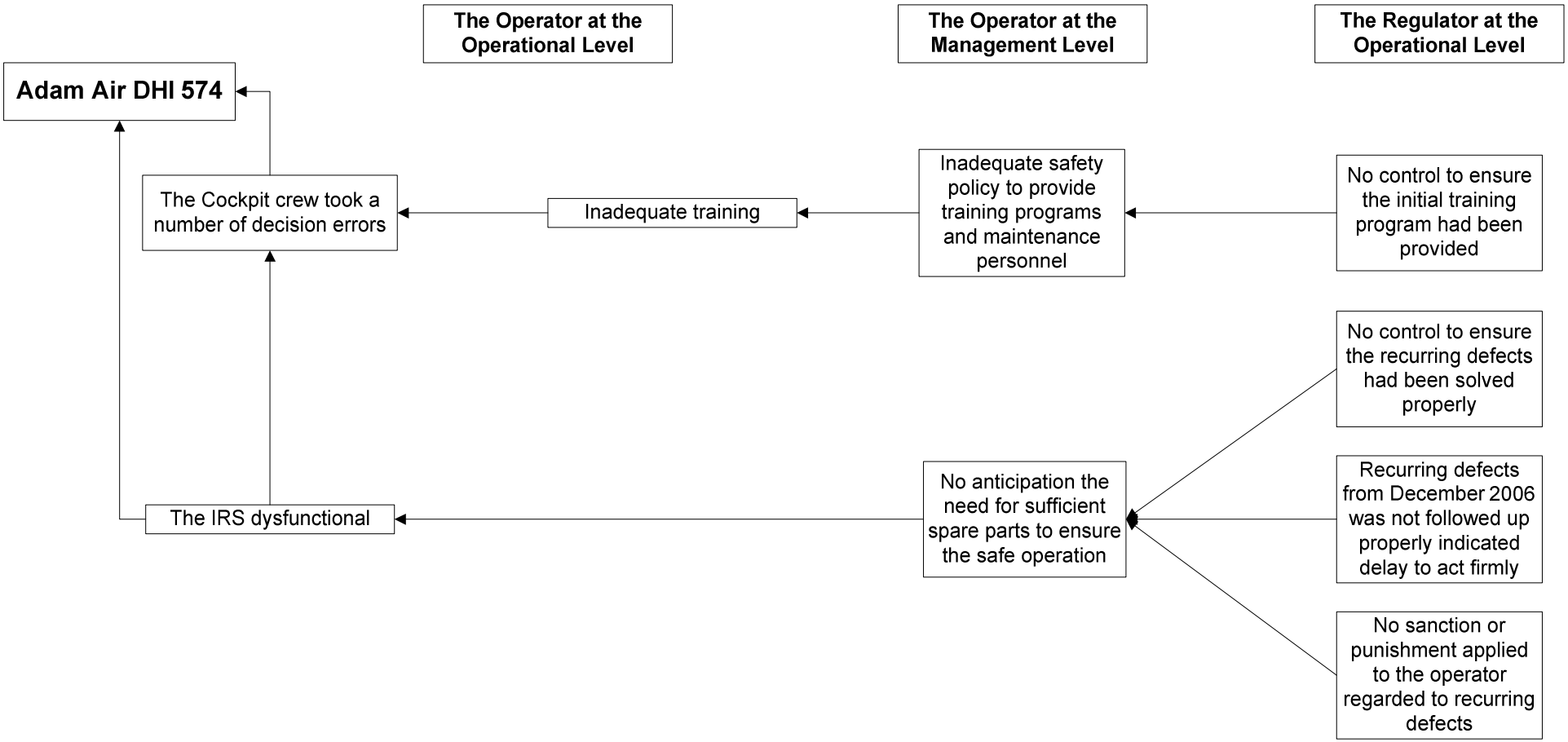
Undeveloped mechanism of recruitment

Lower quality of human resources

Non compliance with the international standard

Appendix C

An example of the Causal Events for the NTSC Investigation Report Analysis



Appendix D

An example of the Caricature Analysis

A caricature published at Kompas newspaper on 10th March 2007, three days after Garuda Airlines GA 200 exceeded its landing speed at Adi Sumarmo Airport and killed twenty one people. The caricature implies failure to learn. The adult said, "....all incidents must have their lessons..!" while the kid curiously answered, "...there were lots of incidents....But, what are the lessons?"

Appendix E
Interview Package

A second fieldwork session is needed to compare and cross-check the consistency of information derived from the first data collection. By conducting interviews, it is hoped that corroboration of the current findings, which were derived from written evidence (e.g. government reports, Medias report). The written data and interviews will be triangulated with the theories relating to aviation and organization, in order to illuminate causal phenomena in Indonesian aviation accidents.

Thus, there are two main objectives of this interview:

1. To investigate the consistency of findings from the written evidences
2. To develop reasonable explanations from written and spoken data to achieve the overall credibility of findings

Based on criteria inherent in the research objectives in my Ph.D. proposal, I identified six groups of people who have been involved in aviation related activities: Operator Officers, Line Management, Investigators, Regulators, Parliamentarian, and Observers.

The first data collection analysis and a review of the literature have been used to develop the open-ended interview protocol. The protocol was designed to solicit the interviewees' views on overall Indonesian aviation accidents and, in particular, the organizational influences that lead the accident to happen. In order to help the participants prepare for the interview, an information package will be sent to them prior to their interview. This package will include a brief description of research. It will also explain the how confidentiality and anonymity will be maintained.

Interview Protocol

Interviewee : _____

Organization : _____

Date : _____

Research Abstract

This research aims to understand the phenomenon in Indonesian Aviation Accidents by analysing the organizational influences that lead an accident to happen. Currently, there is inadequate study in aviation accidents related to organizational influences; this research aims to help fill that gap. This research will determine the organizational factors that contribute to an aviation accident by exploring and discovering how the phenomenon is socially constructed. It will be particularly focused on understanding the accidents, the direct causes, the latent failures, interactions and relationship of actors in Indonesian aviation. The research is situated in the ontological position that Indonesian aviation is a social system. It incorporates traditional and non-traditional hermeneutic elements, in as much as it interprets both written and verbal sources of information. Thus, a qualitative approach to the overall research method is the most appropriate, with discourse analysis being the most suitable analytic approach.

Prior to Interview

1. I will give a brief description of the research
2. I will state how anonymity and confidentially of the interview data will be maintained.
    a. In particular, I will inform the participant that their name will be removed from written and electronic files to eliminate any link between the interviewees and their responses.
3. I will ask them if they have any questions.
    a. If so, then I will answer them as fully as possible.
4. I will ask either they permit me to record the interview or not.
    a. If so, then I will begin recording the interview.
    b. If not, then I will take notes during the interview.
        i. At the end of the interview, I will briefly summarise my notes and ask the participant if there are any corrections to them that he or she would like to make.

Core Questions

1. Tell me about the current state of Indonesian aviation safety.
2. Currently, what are the main issues in Indonesian aviation?
3. In your opinion, why have so many accidents occurred in the past 10 years?
4. Can you speculate on the most probable causes behind these accidents?

Other questions will supplement those above. These supplementary questions will depend on the participant's responses to the core questions.

Appendix F

Interviews Information

No	Interviewee	Date of Interview	Role in Aviation
1	Harun	2 February 2010	Government officer
2	Burhan	2 February 2010	Government officer
3	Arga	3 February 2010	Academic
4	Hani	5 February 2010	CEO of an airline
5	Budi	6February 2010	Pilot
6	Agam	6 February 2010	Academic
7	Dani	8 February 2010	CEO of an airline
8	Beno	9 February 2010	Government officer
9	Catur	10 February 2010	Academic
10	Banu	10 February 2010	Retired pilot and academic
11	Yadi	11 February 2010	Operational Director of an airline
12	Ani	13 February 2010	CEO of an airline
13	Genta	14 February 2010	Academic
14	Muli	16 February 2010	Government officer
15	Bima	16 February 2010	Academic
16	Wahyu	18 February 2010	Transport analyst and academic
17	Novi	18 February 2010	Government officer
18	Ardian	18 February 2010	Aircraft Engineer and academic
19	Kardi	19 February 2010	Pilot
20	Aman	19 February 2010	Chief operational of an airline
21	Hanung	20 February 2010	Academic
22	Ludi	20 February 2010	Aviation analyst
23	Lase	22 February 2010	Academic
24	Odi	24 February 2010	Investigator and

			academic
25	Desta	24 February 2010	Transport analyst and academic
26	Andi	25 February 2010	Academic
27	Yono	27 February 2010	Maintenance manager
28	Masya	1 March 2010	Retired pilot and academic
29	Gyan	2 March 2010	Aircraft engineer
30	Didi	2 March 2010	Senior flight attendant
31	Dian	4 March 2010	Executive director of an airline
32	Karman	4 March 2010	Journalist
33	Anto	4 March 2010	Consultant and academic
34	Wira	5 March 2010	Aircraft engineer
35	Agi	6 March 2010	Public analyst
36	Deni	6 March 2010	Journalist and academic
37	Windra	8 March 2010	Aircraft maintenance officer
38	Beni	9 March 2010	Investigator
39	Gery	9 March 2010	Pilot
40	Sukri	11 March 2010	Senior journalist
41	Kris	11 March 2010	Academic
42	Yoga	11 March 2010	Consultant and academic
43	Yani	12 March 2010	Investigator and academic
44	Anas	13 March 2010	Academic
45	Madi	13 March 2010	Academic
46	Darun	14 March 2010	Government officer

Appendix G

An example of Interview Coding

Original Interview in Bahasa Indonesia	Transcribing to English	Coding
P: Jika kita analisa kondisi dunia penerbangan Indonesia dalam 10 tahun terakhir dimana banyak terjadi kecelakaan dan insiden, bagaimana ini semua terjadi? J: Permasalahan utama adalah system birokrasi kita yang sudah tidak sesuai dengan kondisi saat ini. Contohnya, para pegawai mengeluh tentang gaji dan menyebabkan menurunnya kualitas kerja mereka sementara itu orang-orang yang duduk di level atas tidak mengindahkannya. Kemudian, ketika para pegawai ini tahu bahwa ada kesempatan untuk 'memperoleh' sesuatu , mereka menggunakan kesempatan itu. Disini, siapa yang bisa 'bermain' dan 'memanfaatkan' kondisi, maka akan memperoleh keuntungan. Nuansa korupsi dan kolusi sangat kental disini, khususnya, jika itu berhubungan dengan pengurusan izin. Setelah deregulasi, pemain-pemain baru berdatangan dan berkompetisi di pasar penerbangan Indonesia. Booming juga didukung dengan krisis ekonomi global yang menyebabkan harga pesawat turun. Kondisi ini dimanfaatkan oleh para pebisnis yang bukan orang penerbangan dan tidak tahu tentang penerbangan untuk ekspansi bisnis mereka ke penerbangan. Sementara itu, regulator tidak cukup siap karena mereka tidak memiliki pengetahuan bagaimana meregulasi bisnis penerbangan.	Q: If we analyse the Indonesian aviation condition in the past 10 years, there were lots of accidents and incidents. Why did those happen? A: The main problem is our bureaucracy system that is not appropriate for current condition. For example, government officers complain about the salary and affect their working quality while people in higher level ignore it. Then, when they know there is an opportunity to 'gain' something so they will use that. Here, who is able to 'play' and 'use' the condition, then they will get benefits. The corruption and collusion nuances are really thick here, especially if it is related to license approval. After deregulation, the new entrants entered and competed in the Indonesian air transport market. The vast growth [of market] was also supported by global economic crisis and resulted in decreased of aircrafts. The condition was used by the traders who are not airliners and do not know about aviation to expand their business and enter airline market. Furthermore, the regulator unwell-prepared because they have no knowledge of how to regulate aviation business.