# BSKU SAFETY BULLETIN

**3rd ISSUE** **JANUARY 2019**

## Foreword by the Minister

I take this opportunity to congratulate AAIB for the publication of the third edition of AAIB Safety Bulletin.

2018 was a significant year for the search of the missing aircraft MH370. The search of the missing aircraft by Ocean Infinity Limited in the South Indian Ocean with a *no cure no fee basis* ended without locating the main wreckage. Subsequently, the government took the difficult decision to end the search on 29 May 2018. The report of the investigation of MH 370 was finalised and published on 30th July 2018. I sincerely hope the report has explained the circumstances, findings and recommendations to prevent future similar occurrence. The investigation will be reopened if any new and credible evidence becomes available in the near future.

In pursuing to meet the Annex 13 standard and recommended practice, AAIB is encouraged to continue its other activities to enhance the Inspector's knowledge on air accident investigation by taking part in continuous training, seminars and workshops. This is important in order to keep abreast with the advancement of aircraft technology and investigation techniques.

The government's plan to form Malaysian Transport Safety Board (MTSB) is in the final stage of drafting the Bill for the approval of parliament. I envision that the formation of MTSB will be materialised in the near future and it will be responsible for future accident investigations for all modes of transport i.e. air, rail, road, and sea. With the formation of MTSB as a statutory body, all future accident investigation for all mode of transports will be conducted and managed in a structured and efficient manner.

Lastly, AAIB must endeavour to continue its investigations professionally, independently and without any fear or favour.

*YB Loke Siew Fook*

*Minister of Transportation*.

*"An investigation should aim to uncover not only immediate causes but also underlying or root causes. The rationale here is that the same underlying or root causes occur in many incidents, while specific direct causes may occur only once."*

### In This Issue

This year begins with the government of Malaysia entered into agreement for the search of MH 370 with Ocean Infinity Limited on the 10 of January 2018. The search was utilizing vessel seabed constructor to survey the search area on *no cure no fee basis*.

As a preparation in the event the wreckage is found, BSKU initiated an in house workshop to prepare all our investigators. The workshop took place in precinct 15 together with MH 370 special investigators, Royal Malaysian Police, Disasters Victim Identification Expert, and experienced investigator from BEA, France for sharing of their experience in the investigation Air France flight 447 accident. The workshop took place from 22 to 24 January 2018.

The search however was not successful and the final report for the accident of MH 370 was concluded and made available in Ministry of Transport official web site on 30th July 2018.

There were 4 accidents occurrences this year involving light aeroplane and 2 light helicopters accidents without any fatality. Three serious incidents occurred involving 737-800 and Airbus 330-300. BSKU investigate the serious Incident of Boeing B737 occurred in Kathmandu and the Airbus serious incident was investigated by the state of occurrence in Maldives and Australia.

Several hazards were identified as listed in figure 2 for us to learn from. I wish operators can share these hazards and to look into their operations if this similar risk exist.

As a Chief Inspector of AAIB, I am happy to say that 2018 has been a safe year for Malaysian Aviation, even though we had experienced a significant change in government leadership.

Please keep vigilant to new hazards and assessed for any risks. We cannot reduce the risk to ‘zero’ but keep it as low as reasonably practicable in the coming year 2019.

Thank you and a happy new year.

Captain Dato’ Yahaya Abdul Rahman
Chief Inspector
Air Accident Investigation Bureau

## 2018 ACCIDENT AND SERIOUS INCIDENT

| No. | File No. | Date of Occ. | Air-craft Reg. | Aircraft Type | Place of Occ. | Cat. | Nature of Occ. |
|---|---|---|---|---|---|---|---|
| 1. | A 01/18 | 01/02/2018 | 9M-ZWR | Cirrus SR20 G3 | Tioman Airport | TURB | A/C veered off runway and hit the aerodrome fence |
| 2. | A 02/18 | 25/02/2018 | VH-FOS | Mielec Dromader M-18A | Keratong, Pahang | SCF-PP | A/C crashed due to engine failure |
| 3. | A 03/18 | 13/03/2018 | 9M-PHJ | AS355N | Sibu, Sarawak | ARC | Hard landing |
| 4. | SI 04/18 | 19/04/2018 | 9M-LNJ | B737-900 | Kathmandu, Nepal | RE | Rejected take-off & A/C overshot runway |
| 5. | SI 05/18 | 07/07/2018 | 9M-XXC | A330-300 | Maldives | GCOL | A/C wingtip collided with other A/C horizontal stabiliser during taxing |
| 6. | SI 06/18 | 18/07/2018 | 9M-MTK | A330-300 | Brisbane | OTHR | Airspeed indication failure on take-off |
| 7. | A 07/18 | 16/08/2018 | 9M-RML | Robinson R66 | Subang Airport | LOC-I | A/C lost control during lift off and main rotor hit ground |

AFTO and GA

Scheduled Operator

## 2018 ACCIDENT AND SERIOUS INCIDENT

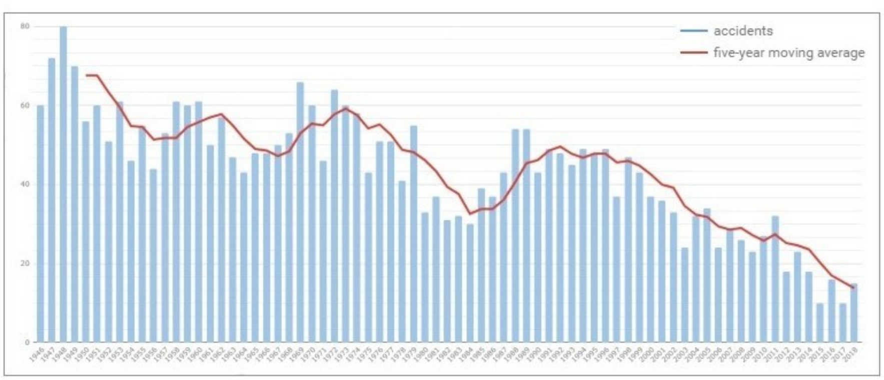
| | Acci-dent | Serious Incident | Total | Fatality |
|---|---|---|---|---|
| AFTO and GA | 4 | 0 | 4 | 0 |
| Non Scheduled Operator | 0 | 0 | 0 | 0 |
| Scheduled Operator | 0 | 3 | 3 | 0 |
| Total | 4 | 3 | 7 | 0 |

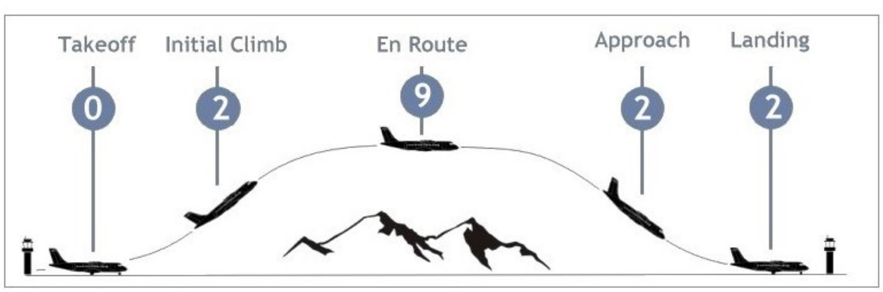
| Catego-ries | |
|---|---|
| SCF-NP | 1 |
| TURB | 1 |
| ARC | 1 |
| RE | 1 |
| GCOL | 1 |
| LOC-I | 1 |
| OTHR | 1 |
| TOTAL | 07 |

Note:
SCF-NP - System/Component Failure or Malfunction (Non-powerplant)
TURB - Turbulence Encounter
ARC - Abnormal Runway Contact
RE - Runway Excursion
GCOL - Ground Collision
LOC- I - Lost of Control - Inflight
OTHR - Other

## 2018 GLOBAL AIRLINER ACCIDENT STATISTIC

**556** fatalities **15** fatal accidents



# HAZARDS IDENTIFIED FOR 2018 ACCIDENT AND SERIOUS INCIDENT

| Serial | File | Date of Occurence | Aircraft Type | Place of Occurence | Nature of occurrence | Fatal-ity | HAZARDS *See note 1* |
|---|---|---|---|---|---|---|---|
| 1 | A 01/18 | 01/02/18 | Cirrus SR20 9M ZWR | Tioman, Pahang | AC veered off runway | Nil | Non-compliance to local Instruction<br><br>Not proficient for short runway landing |
| 2 | A 02/18 | 25/02/18 | M18 Drom-ader VH FOS | Keratong, Pahang | Fuel starvation | Nil | No proper storage of refuelling equipment<br><br>Technician proficiency |
| 3 | A 03/18 | 13/03/18 | AS355N 9M PHJ | Sibu, Sarawak | Hard landing during training | Nil | Misjudged ROD during one engine inoperative training |
| 4 | SI 04/18 | 19/04/18 | B737-900 9M LNJ | Kathman-du, Nepal | AC veered off runway during abort take off | Nil | Poor CRM<br><br>Non conformity to take off procedure |
| 5. | SI 05/18 | 07/07/18 | A330-300 | Maldives | Wing tip collide with horizontal stabiliser of an-other aircraft dur-ing taxy | Nil | Fast taxi speed<br><br>Not monitoring wing watcher |
| 6. | SI 06/18 | 18/07/18 | A330-300 | Brisbane | Pitot cover not removed | Nil | Poor communication between ground and air crew<br><br>Local directive not communicated to air-crew<br><br>Decision making to continue take off |
| 7 | A 05/18 | 15/08/18 | Robin-son 66 9M-RML | Subang | Crash during sloping ground take off | Nil | Improper pre- flight brief<br><br>Instructor's lack of situational awareness |

*Note 1*

*It is not the aim of this report to be used for assigne fault or blame but it is for avoidance of simillar occurrence in the future.*

# ANALYSIS OF ACCIDENTS AND INCIDENTS

## Introduction

There is great variation in the extent, scope and type of incident investigations that are conducted. There is also a great diversity in the methodologies that investigators use to analyse, depict and explain their findings. In the investigation phase, the focus is on gathering information to determine what events exactly occurred before, during and Immediately after the incident. The gathered information are useful to ascertain what contributed to the accident directly and indirectly.

There can be no prescribed order or sequence in which to gather information. In general one should attempt to retrieve the most vulnerable information first. If it is not yet clear whether some information will eventually be needed to conduct the analysis, the general advice is to retrieve and include the information anyway and evaluate its relevance later.

## Developing a timeline

After information has been gathered, the next step is to conduct the actual analysis and to determine the cause(s) of the incident. In many cases, the gathering of information and the analysis of the incident will need to take place as an iterative process. Starting the analysis may, for example, clarify the need to gather additional information via new interviews.

The first step in conducting an analysis will generally be the development of a detailed timeline. The goal of using a timeline during the investigation is to structure events and actions in time accurately. Doing this helps the investigator to evaluate potential causal pathways. After the timeline is (partly) developed there are many models and methods available that can help the investigator to analyse, structure and communicate the findings.

The information gathered can be used to develop a detailed step-by-step description of the incident and all the events that led up to the incident. The investigator should focus on making an overview of all the (potentially) relevant events, actions taken by people, state of equipment etc. A technique that can be used to depict a basic timeline is a Sequential Timed Event Plot, also known as a STEP diagram. Events, activities, system states etc. can thus be organised into a single overview.

The timeline should be focused mainly on ‘what’ happened (the events) and less on why things happened (the causes). This is because there may be multiple (interacting) causes for any event on the timeline and causes may not be close together in time or place.

In order to represent the causes of an incident other techniques are likely to be more appropriate.

**Using a model to analyse findings**

An investigation should aim to uncover not only immediate causes but also underlying or root causes. The rationale here is that the same underlying or root causes occur in many incidents, while specific direct causes may occur only once. Different incident investigation tools and methods are available to help investigators uncover the underlying causes. These methods are often strongly related to underlying models of causation. Hollnagel (2004) distinguishes the methods of analysis into three types; simple sequential accident methods, epidemiological accident methods and systemic methods.

The simplest accident methods describe the accident as the end result following a sequence of events that occur in a specific order. In a sequential accident model, the accident is an unexpected, unintentional event leading to an unwanted outcome caused by one or more preceding events. Clear causality and identifiable cause-effect links are assumed in these models. An example of this type of method is a basic event chain model. The well known domino-effect model (Heinrich, 1931) can be seen in relation to sequential analysis methods.

Epidemiological methods postulate that an accident is the result of multiple factors which are present simultaneously as both clear and more hidden (latent) factors. These models focus more on performance deviation rather than unsafe acts, environmental conditions that could lead to the performance deviation, barriers that could have prevented the accident and dormant latent conditions that may have been present for a long time before contributing to the occurrence. The Swiss-cheese model of incident causation first proposed by Reason (1990, 1997) can be seen as an example of epidemiological models of incident causation.

Systemic methods try to describe the characteristic performance on the level of the system as a whole, instead of a structural decomposition of the system. In this view accidents are emergent phenomena of the normal functioning of a system. In this sense accidents are normal and natural, expected phenomena. In addition, systemic models attempt to account for so-called non-linear effects, whereby a small input into the system (‘cause’) can have a much larger amplified effect later. The systemic models have developed their own new methods for incident investigation, such as: Accimap, FRAM,or STAMP.

## Choosing a model

The choice of model and method can have consequences for the type of factors that are uncovered in an analysis and this may result in different conclusions and recommendations. One important difference between methods may be the extent in which they allow and help the investigator to 'dig deep' and to find underlying or 'root' causes of incidents. Other factors to consider are:

- the complexity of the method;
- ease of use of the method;
- amount of training required for using the method;
- level of use of the method (in the sector);
- the presence of a professional community;
- quality of the method for communicating results;
- maturity of the analysis method.

There is no general rule for what is the most suitable analysis model for any particular enterprise. There are, however, several sources that describe and compare incident investigation methods, some of which are freely available online. In practice an investigator could best combine multiple techniques, such as an event chain or timeline and an epidemiological or systemic method (e.g. Tripod Beta, STAMP).

Apart from the type of method used there are likely to be many other factors that determine the quality and depth of an investigation, for example, the training and experience of the investigators, and the available resources. At the moment there is little empirical evidence on which factors are most important for the development of a good (in-depth) incident analysis.

## A useful analysis model

As above, there are many accident analysis models and methods available. Whilst this report has so far provided some guidance on how to select an appropriate analysis technique, it is acknowledged that individuals may not have time to perform a comprehensive method comparison. Therefore, this section provides the reader with an 'off-the-shelf' analysis tool that can be readily employed. The analysis technique in question is the Australian Transport Safety Bureau (ATSB) accident investigation model and has been used in transport accident investigations by the ATSB since 2002 (ATSB, 2008). As such, the model has been empirically validated by a governmental investigation agency, which is highly regarded within the accident investigation community (ATSB, 2008). Therefore, the ATSB model arguably represents a 'tried and tested' class leading analysis technique. Furthermore, a detailed (and publically available) description of the model and its use is provided by the ATSB (2008). Therefore, the user of the model has free access to guidance material which can enhance the usability and reliability of the model.

### Description of the ATSB model

The ATSB investigation analysis model (referred to hereafter as the 'ATSB model') is a modified version of the well-known Swiss cheese model (SCM). As per the SCM, the ATSB model provides a general framework that can guide data collection and analysis activities during an investigation (ATSB, 2008). However, various alterations to the original SCM were made by the ATSB to improve its usability and the identification of potential safety issues. Such changes include an enhanced ability to combine technical issues into the overall analysis, the use of neutral language and emphasising the impact of preventative, as well as reactive, risk controls. To highlight the changes made, the ATSB (2008) presented a latter version of the SCM (see Fig. 1) and their adaptation to it (see Fig. 2).

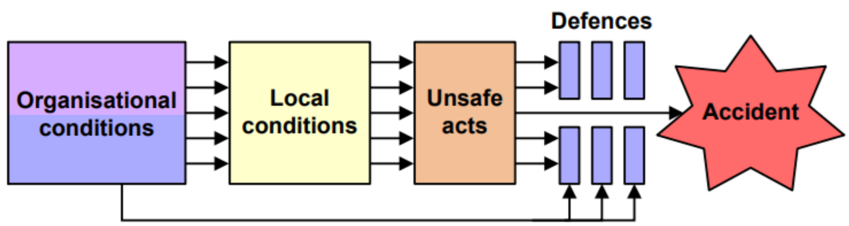



Figure 1 – Latter version of SCM (adapted from ATSB 2008)

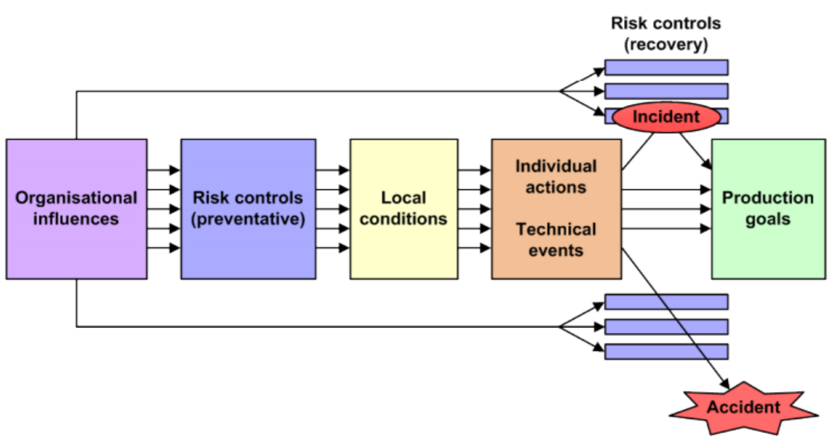



Figure 2 – ATSB adaptation of the SCM (adapted from ATSB 2008)

As indicated by Fig. 2, the ATSB model views organisations as goal seeking systems whose performance can become unsafe from the result of interacting events and conditions. In this situation risk controls are required to prevent an accident from occurring or minimise the severity of its consequences (ATSB, 2008). These risk controls are akin to the layers of defenses portrayed in Fig. 3. Whereas Fig. 2 highlights some of the changes that the ATSB made to the SCM, the official representation of the ATSB model which is used during investigations is presented in Figure 3. The model represents the operation of a system via five levels of ‘safety factors’, where a safety factor is an event or condition that increases safety risk (ATSB, 2008). The first three levels correspond to ‘safety indicators’, i.e. safety factors dealing with the individual or local aspects of an accident. Safety indicators are not generally safety issues themselves, but may provide indications that safety issues exist (ATSB, 2008). The upper two levels address ‘safety issues’, i.e. safety factors associated with organisational or systemic issues. The following section provides a brief overview of each of the levels of the model (see ATSB (2008) for more details).

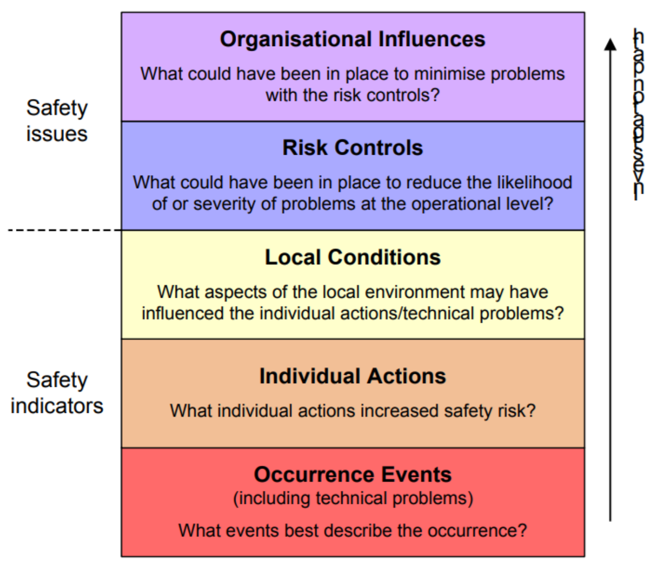



Figure 3 – The ATSB Investigation Analysis Model (Adapted from ATSB 2008)

## ATSB model terminology

Occurrence events are the key events (including technical problems) which describe an accident or incident, or which ultimately need to be explained by an investigation, i.e. they are the safety factors that describe 'what happened'. Individual actions are the observable behaviours of operational personnel. Operational personnel are those individuals who can have a relatively direct impact on system safety, e.g. flight crew and maintenance personnel. Local conditions are conditions which exist in the immediate environment or context in which individual actions or technical events take place, and which can influence the individual actions or technical events. Local conditions include characteristics of the individuals and the equipment involved, as well as the nature of the task and the physical environment (ATSB, 2008).

Risk controls are the measures created by an organisation to facilitate and assure the safe performance of operational system components, i.e. operational personnel and equipment. They can be viewed as the outputs of the organisation's safety management system and can be categorised as 'preventative' or 'recovery'. Preventive risk controls are designed to minimise the likelihood of undesirable local conditions, individual actions and 18 occurrence events. These controls facilitate and guide performance at the operational level and can include procedures, training, equipment design and work rosters. Recovery controls are put in place to detect and correct (or otherwise minimise) the adverse effects of local conditions, individual actions and occurrence events. These 'last line' controls include warning systems, emergency equipment and emergency procedures. Organisational influences are those conditions which influence the effectiveness of an organisation's risk controls and can be classed as internal organisational conditions or external influences. Internal organisational conditions are the safety management processes and other organisational characteristics which influence the effectiveness of its risk controls. Examples of safety management processes include hazard identification, risk assessment, change management and training needs analysis. External influences are the processes and characteristics of external organisations which impact on an organisation's risk controls and its internal organisational conditions. Various external influences exist, e.g. regulatory standards and surveillance or pressures and standards provided by industry associations and international standards organisations.

**ATSB model usage**

The ATSB suggest that the most effective way of using the model to identify potential safety factors is to start at the bottom level and work upwards, asking a series of strategic questions. Broad questions for each level are included in Fig. 5. The ATSB (2008 p.49-56) also provide detailed guidance on their investigation approach and how potential safety factors can be tested for their existence, their influence on an accident and whether they require further analysis. Many accident analysis techniques use charts to graphically represent the findings of an investigation and the ATSB model is no exception. Use of analysis charts can make it easier to see the potential relationships between safety factors, identify gaps in the analysis which require further explanation. Furthermore, charts can also be useful for communicating the findings of complex investigations. A charting format preferred by the ATSB is based on the Accimap method (Rasmussen, 1997). It shows the occurrence events involved in an accident from left to right and adds the contributing safety factors to these events in a series of hierarchical layers. The influence that a given safety factor has on others is indicated by a connecting arrow. An example of such an analysis chart is presented in Fig. 6. In the ATSB's experience, the use of this charting format has considerably helped the explanation of complex accidents and incidents to industry personnel during presentations and courses.

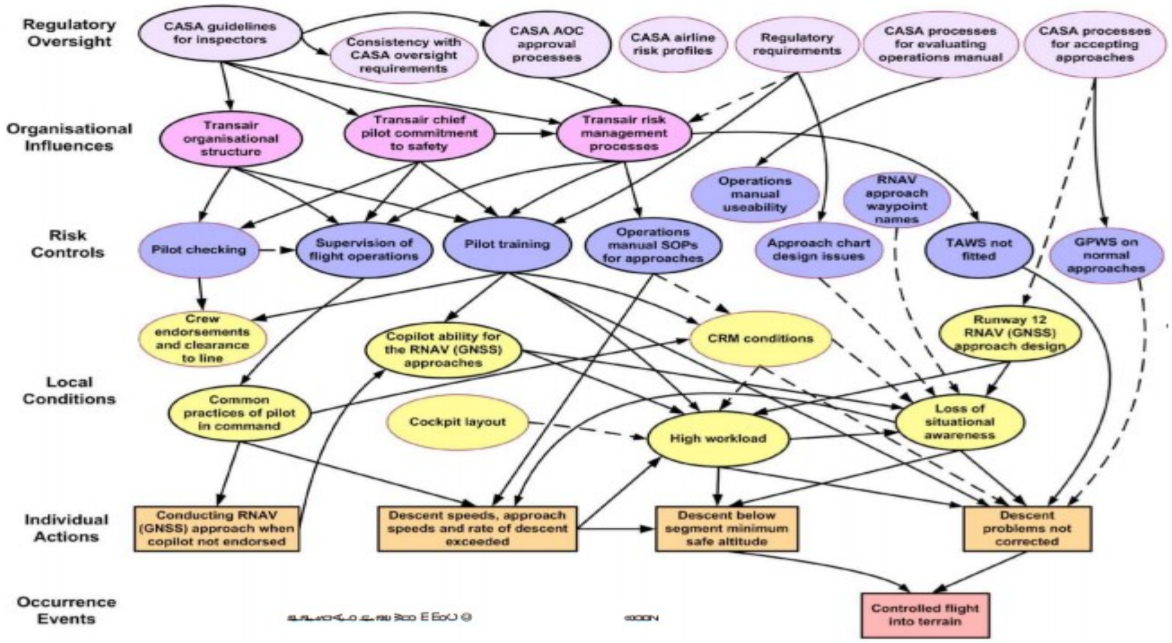



Figure 4 – Safety factors chart of the Lockhart River Metro 23 aviation accident (From ATSB 2008 )

As with any model of accident causation, the ATSB model has limitations. For example, many safety factors can be proposed which do not neatly fall into one of the levels. Furthermore, the limited descriptive nature of the model does not fully explain the complex, dynamic nature of accident development. An important example is the concept of local rationality. Actions and decisions taken by people at all levels of a system are affected by their local goals, resource constraints and external influences. To understand why an individual (or team) took a decision or course of action, such activity must be placed in context by examining the local conditions. The ATSB model explicitly addresses this requirement at the operational level, however, the context in which organisational influences were generated are not incorporated into the model. Therefore, the user should investigate, if possible, the local conditions that were present at the organisational level of a system. This will help achieve a deeper understanding of an accident and avoid the inappropriate blaming of an organisation’s management. As well as investigating individual accidents and incidents, there is often a need to analyse data from multiple events to identify trends in contributing factors.

The use of taxonomies to classify contributing factors is a convenient way to achieve this, albeit that they restrict the flexibility of an analysis (see Section 3.3). The ATSB model does not have a publically available taxonomy so the user, if free to do so, would need to devise an appropriate classification system for their organisation/industry. However, many users may already have a given taxonomy in place, which is incorporated into an organisational and/or regulatory database, and this may not be possible. Despite these limitations, the ATSB (2008) state that their experience of using the model has shown that it provides an appropriate balance between ease of use and full realism when identifying potential safety factors and communicating the findings of safety investigations.

## SUMMARY

For many organisations and AOC holders, incident investigation and analysis is an important step in efforts to learn from mistakes and to reduce risk and improve safety of the organisation. Operators investigate incidents in order to understand not only what went wrong, but also why it went wrong, and what can be done to prevent reoccurrence. From an SMS perspective the main goal should be to understand the risk factors and the causes of the incident. Blame and fear can seriously complicate any efforts to uncover what really caused an unwanted event. The period directly following the occurrence of a serious incident is often a time of great confusion. As a result the best time to develop an effective incident investigation procedure is before an incident occurs. Each organisation should consider the criteria for whether to investigate incidents arising from its operations. Ideally this decision should not only focus on the seriousness of the event (outcomes) but also on the potential for learning from the event. When an accident occurs there are many different methods available which can be used to conduct an analysis. The best safety improvements may be expected when the method selected allows the investigator to dig deep and to uncover ‘root causes’ or ‘underlying causes’ rather than just the immediately apparent causes.

**CI BSKU**

*1 February 2018*

*Cirrus SR20 G3 veered off runway at Tioman airport*

*25 February 2018*

*Mielec Dromader M-8A crashed in Keratong, Pahang due to engine failure*


*13 March 2018*

*AS 355N on a hard landing at Sibu Airport*



*19 April 2018*

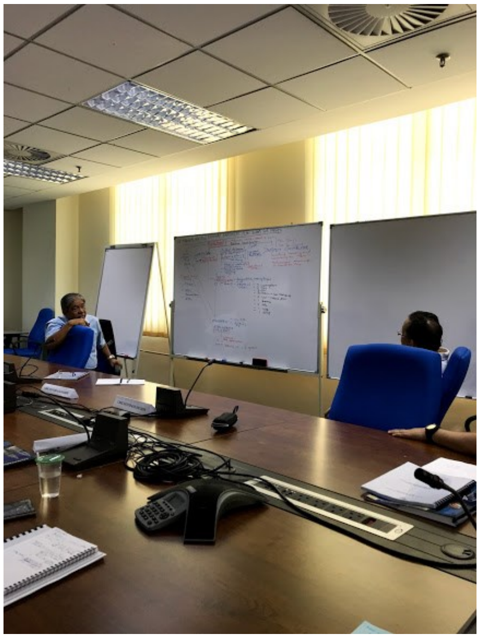
*Malindo's B737-900 rejected take-off and aircraft overshot runway in Katmandu, Nepal*

*16 August 2018*

*Lost control of Robinson R66 during lift off and main rotor hit the ground in Subang Airport*

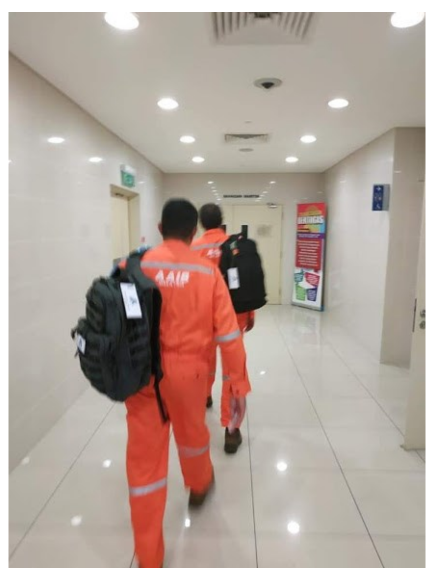



**The final report on MH370 was presented to the public on 30th July 2018 by the Malaysian ICAO Annex 13 Safety Investigation Team led by Dato' Kok Soo Chon.**




**BSKU's in house Aircraft Wreckage Recovery Workshop to prepare all our Investigators with MH370 special Investigators, Royal Malaysian Police, Disasters Victim Identification Expert, and experienced investigator from BEA, France in the event of MH370 found. The workshop took place from 22 to 24 January 2018.**

**BSKU was involved in the Air Disaster Exercise codenamed "Ex Perisai Panthera" in Kuala Lumpur International Airport from 17 to 19 October 2018. BSKU also participated in the Airport Emergency Plan Workshop.**




***First Air Accident Investigation Course jointly conducted by BSKU and UniKL MIAT***


***CI and Kol Izani attending the AIG-APAC in Bangkok***

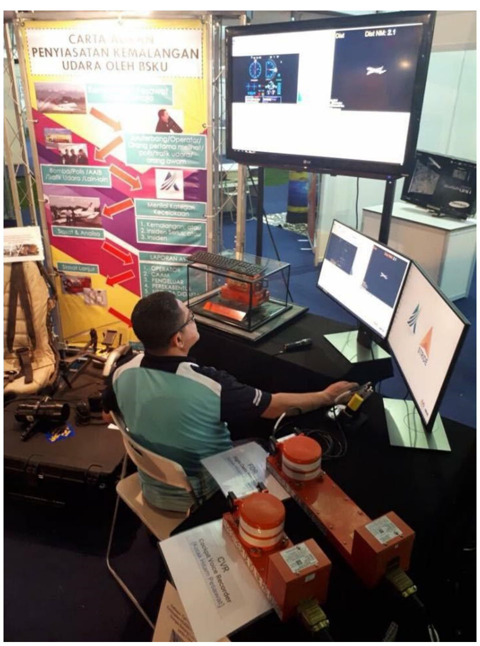
***Visit by Dutch Transport Safety Board***


***Visit by Regional Aviation Safety Group Asia and Pacific Regions (RASG-APAC)***

***BSKU meeting with Civil Aviation Authority of Malaysia discussing Memorandum of Understanding***


***Visit by Korea Transportation Safety Authority. The visit was to discussed cooperation between them and BSKU.***

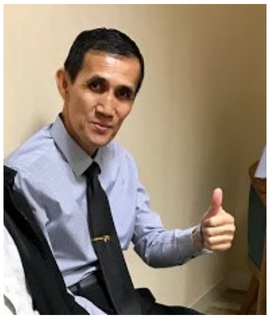
***Lt Col Marzuki as the head of BSKU FDR Laboratory attending seminar organized by Kingdom of Saudi Arabia Aviation Safety Board***





***Ministry of Transportation Carnival in Bentong***

***NBOS Carnival in Mempaga Bentong***



**Welcoming Brig Gen Yee RMAF to BSKU**

**Tagging of MH 370 debris**


**BSKU Diver in Tioman**


**Ms Salwana at NBOS Carnival in Bentong**

**BSKU Aidil Fitri Raya do**

| DATE | PROGRAM |
|---|---|
| 29 Jan | VISIT TO CAE KL SDN BHD |
| 31 Jan | VISIT TO PWN EXCELLENCE SIMULATOR |
| 11 - 22 Feb | AIRCRAFT ACCIDENT INVESTIGATION COURSE |
| 25 Feb - 1 March | LIMA 19 SEARCH AND RESCUE EX |
| 26– 30 March | LIMA 2019 |
| 16 Apr | AAIB SAFETY SEMINAR |
| 22- 26 Jul | APC-AIG SEMINAR |

**Contact Us**

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