

The Line Operation Safety Audit (LOSA) as an integral part of SMS

노선 안전운항 감사 (LOSA)의 기능

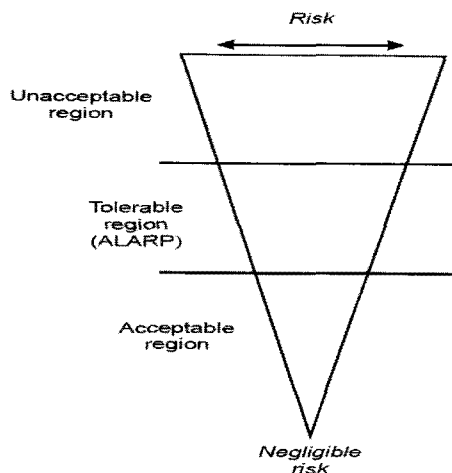
최진국* (아시아나항공), 안경수, 정원경(성화대학), 김철영(한국항공대학교)

I. INTRODUCTION OF SAFETY

Safety is the state in which the risk of harm to persons or property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazards identification and risk management.(ICAO, 2006)

With the continuous efforts by the aviation society, the accident rate have been significantly declined. In the past it was focused to eliminate risk to zero. No one can guarantee to be absolute safe or free from risk.

<Figure 1-1> Tolerability of Risk (ICAO, 2006)

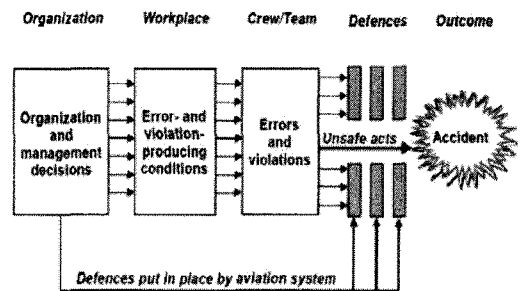


There is a need to manage the risk as low as practicable so the risk could remain in the acceptable region. The hazard can be identified through LOSA which is one of the

effective proactive safety process to manage the risk to an acceptable level in the system.

It is important to understand the accident and incident causation for effective safety management system(SMS).

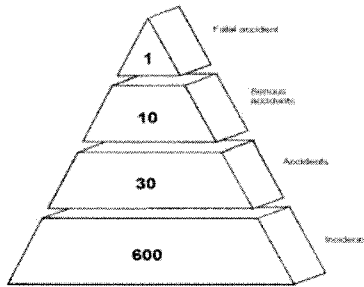
<Figure 1-2> Accident causation model (ICAO, 2006) Adapted from Prof. James Reason



The failure of the defence in the system may cause the accident. The errors and violations which have immediate adverse effect are unsafe acts. The last defences in the system are persons in the front line.

There usually are precursors before the accident occurs. There are good opportunities to prevent tragic accident happening when we identify these safety deficiencies and weakness.

<Figure 1-3> 1:600 Rule (ICAO, 2006)



Henrich's ratio was originally researched for industrial accidents. International Civil Aviation Organization(ICAO) has modified the ratio as above. It shows that for every fatal aviation accident there can be 10 serious accidents, 30 reportable incidents(minor accident) and as many as 600 other (non-reportable) incidents. It could be indicators of potential serious safety problems in the organization when there are many un-reportable incidents. These will eventually lead to an accident if these are not managed.

When we know these errors and threats, we could improve the system more effectively. The accident can be prevented when we identify why the accident or incident happen.

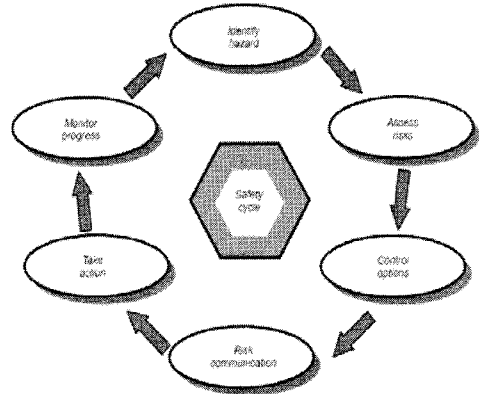
The propose of this paper is to introduce the safety monitoring tool of line operation safety audit (LOSA) according to ICAO DOC 9803 which is integral part of SMS, and ICAO SMS Manual 9859.

II. SAFETY MANAGEMENT SYSTEM (SMS)

1.1 The cycle of SMS

The primary purpose of SMS is to identify hazards and control risks, and there are methods to identify report and analyze hazards. There must be procedures to manage risks so that these risks could be dealt with in standardized manner. There should be on-going program to evaluate the actions in the system so this cycle could flow automatically.

<Figure 2-1> Safety cycle (ICAO 2006)

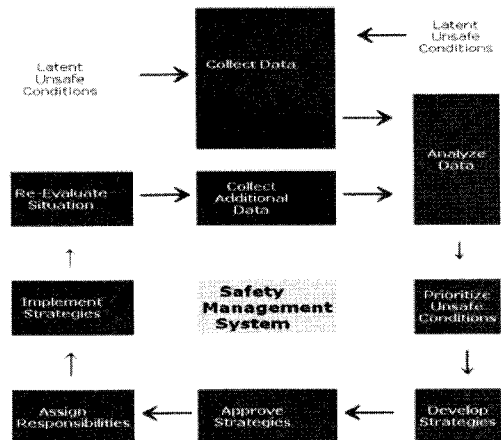


Here is an example of systematic process as above produced by ICAO. The safety cycle starts with identifying hazards when there are hazards in their environment, then takes actions through the control options and risk communication.

1.2 The process of safety management

There are unidentified latent unsafe conditions on our daily operation. The airlines collect data on these conditions to analyze looking for the hazards. Safety management is based on evidences, so it requires actual data to identify hazards.

<Figure 2-2> Safety Management Process (ICAO)



If there is no data, then it is only an opinion. The priorities of unsafe conditions can be set to reduce the risk. The

organization can assign responsibilities to implement these actions then evaluate the situation if these unsafe condition is managed to a acceptable level.

2. The function of LOSA as a part of SMS

2.1 Description of LOSA in ICAO SMS manual DOC9859

- Hazards may be identified through Proactive safety process such as flight data analysis(FDA), LOSA and Normal operation safety survey(NOSS) (CH5, hazard identification)

- Organizations with adequate safety oversight employ the method such as FDA and LOSA- Systematic capture of data which reflect actual day-to-day performance (DOC9859 CH10, safety oversight)

- One method of monitoring normal operations on the flight deck is LOSA using TEM model, analysis of safety data has provided airlines with important sight into the threats and errors. (DOC9859 CH10 , safety monitoring)

- More experienced employees need refresher training for articular safety process such as FDA or LOSA. (DOC9859 CH12, safety promotion and training)

- Some organizations conduct safety surveys at regular intervals, and when an organization is undergoing significant change, during the introduction of a major new safety initiative, such as FDA or LOSA. (DOC9859 CH15, Survey frequency)

- ICAO endorsed LOSA as the primary tool to develop countermeasures to human error in aviation operations for monitoring normal flight operations to collect data. (CH16, ICAO's role)

- LOSA monitors normal operations for accident prevention. LOSA facilitate hazard identification through the analysis of actual performance during the flight. LOSA identifies threats of aviation safety in order to understand human performance, and human behavior, manage the risks which

maybe generated by threats and identify errors of the human to implement measures to manage human errors. (CH16, LOSA)

- LOSA provide data to the airline on how the organization manages threats, operational risks and errors committed by crew in the front line to prioritize and implement actions to improve safety. LOSA also provide the data of successful behavior and the failure of the safety system. These successful outstanding performances can be use for the CRM training. (CH16, LOSA)

III. LINE OPERATION SAFETY AUDIT (LOSA)

1. WHAT IS LOSA?

The human performance less than optimum caused the majority of the accident and incident even though there has been continuous effort of the aviation industry to improve the safety.

LOSA is a proactive data collection system on crew and system performance to capture these performance which is less than optimum during normal operations. The major objective of LOSA is to measure how the crew manage threats, errors and undesired aircraft deviations in the cockpit on day to day operations.

LOSA provides why errors happen and how the crew manage these errors while other conventional SMS like FOQA may provide only what happened. The other safety tools are using data from failed performance such as accident and incident while LOSA provide positive feed back, success story or outstanding performance that can be reinforced and trained.

The trust from the line pilot on LOSA is the key for successful LOSA. When there are the pilots does not trust LOSA, they will show fake performance instead of the natural performance in the cockpit according to TLC.

LOSA provides numbers of the threats and errors in detail in comparisons with other fleets and airlines so the managers may

identify why those happened to improve the SMS and the flight environment.

2. THE PURPOSE OF LOSA

Line Operations Safety Audit (LOSA) and Threat & Error Management (TEM) are integral parts of a Safety Management System (SMS).

LOSA has shown its success on the major improvement on many areas including the riskiest phase called the blue box, which is the busiest phase during approach and landing.

The first Threat and Error Management LOSA was developed in 1996 in collaboration with Continental Airlines. When they measured second LOSA in 2000, they found many improvements in checklist usages, unstable approaches and these were confirmed by FOQA data.

3.1 LOSA CHARACTERISTICS (ICAO)

There are 10 characteristics of LOSA according to ICAO DOC 9803. If there are not these characteristics, the requirement of LOSA recommendations can not be met. (ICAO, 2002)

- 1) Jump seat observation during normal flight
- 2) Anonymous and confidential data collection
- 3) Voluntary flight crew participation
- 4) Joint management, pilot association sponsorship
- 5) Safety targeted data collection form
- 6) Trusted and rained observers
- 7) Trusted data collection sites
- 8) Data cleaning round tables
- 9) Data-derived targets for enhancement
- 10) Result feed back to line pilot

4. SAFETY CHANGE PROCESS (ICAO PROCEDURE)

4.1 TYPICAL EXPECTED SCP ACTIONS (ICAO)

- 1) Modifying procedures or implementing

new ones.

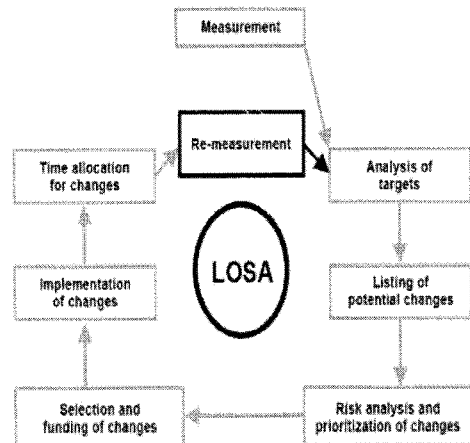
- 2) Redefining operational philosophies and guidelines

- 3) Arranging specific training in error management and crew countermeasures.

- 4) Reviewing checklist to ensure relevance of the content and then issuing clear guidelines for their initiation and execution.

- 5) Defining tolerances for stabilized approaches, as opposed to the "perfect approach" parameters promoted by existing SOPs.

<Figure 3-1> The safety change process(SCP)



5. TEM

Continental Airlines uses TEM as an integral part of a Safety Management System. Continental Airlines uses Monitoring and Crosschecking skills in their flight operations to manage threats and errors. (Gunther, 2005).

5.1 THREATS

Threats are events or errors happened outside the flight crew's influence, but need to be managed to keep safety. Threats increase the risk during the flight regarding safety. Errors caused out side of the cockpit crew are regarded as a threat.

5.2 ERRORS

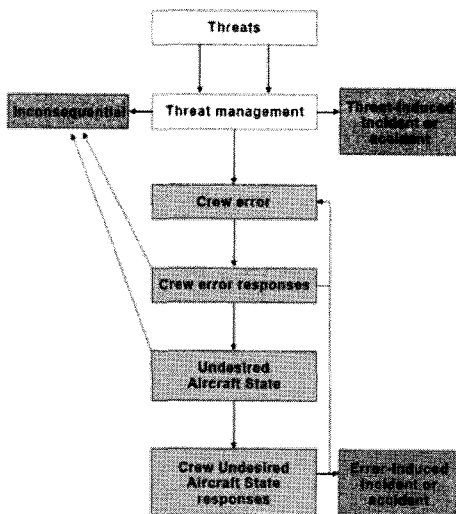
Error is an action or inaction by the cockpit crew that leads to deviations. Errors tend to reduce margin of safety and increase the probability of the accidents or the incidents.

5.3 UNDESIRED AIRCRAFT STATES

Undesired aircraft states(UAS) is a flight crew induced aircraft state that clearly reduces safety margins. The undesired aircraft states is as close to an accident. Mismanaging these undesired aircraft states may lead to an accident.

5.4 THREAT AND ERROR MANAGEMENT MODEL (ICAO)

<Figure 5-1> The threat and Error management model



V. CONCLUSIONS

Reason's accident causation model explains the accident occurs when the weaknesses are present but the other defence are not functioning properly. These could be identified and corrected the weakness through the LOSA as part of effective tool in the SMS.

We believe LOSA can help management to train and set up the system so crew could avoid committing errors, manage their own

errors to control risks. LOSA is a non jeopardy proactive monitoring tool to assess the normal operation flight to identify hazard. Re-LOSA can monitor the feedback after the training and procedure, and system have been improved. we know LOSA is a scientific approach using TEM explaining why and how error are occurring in the front line of defence. With LOSA, airlines could set up effective TEM training since they provide exact threats and errors within the organization with narratives and raw data with metrics and comparison with other airlines. LOSA is the integral part of the SMS.

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