운항시간 압력 및 Threat과 Error 관리

The Operational Time pressure and TEM

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Summery

Theflight deck crew are under the operational time pressure in the cockpit. The crew tend to make errors when they face the threats of operational time pressure because they are in a rush. The flight deck crew can reduce threats and errors which existing within the airlines by using threat and error management when the crew know these threats and errors. The airlines can implement meaningful safety management system by analyzing into the useful information for to identify the hazard and manage the risk to reduce these threats and errors since aircrafts accidents can be fatal.

With the threats and errors that were found regard to operational time pressures, company may implements safety change process to improve the safety systematically and the crew can manage the threats and errors more effectively.

1. INTRODUCTION

1.1 The operational time pressure and the safety

There are a lot of activities of aviation these days, and they create more complex and hazardous environment. The airlines are competing to sell more seats for their passengers by offering more comforts, on time operations and safety. These dynamic environments give flight deck, dispatchers, ground staff, maintenance crew, and ATC crew more workload and complexity. The threat and errors induce crew errors and undesired aircraft state as Threat and Error management model explains.

NTSB analyzed 37 Accidents of US 121 Airlines during 1978-1990and they have found significant facts as follows.

- Figure1:Major findings and the percentage of the accidents

Captain was Flying Pilot	81%
First Day of Trip	73%
First Flight	44%
F/O Time in Position/Aircraft	• Average 419 hours/seat • 50% First Year
Time Since Awake (TSA)	• Captain 12 plus hours • FO 11plus hours
Late or behind schedule	55%

- Figure2.:Time of the day and percentage of the operations and accidents.

Time of Day	Operations	Accidents
0600 - 1400	44%	27%
1400 - 2200	43%	43%
2200 - 0600	13%	30%

It is quite noticeable that 55% of the accident flights were delayed. This tells delayed flights could be one of the cause of accidents.

2. THREATS

2.1 Definition of 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.

It helps flight crew to manage threats when we know kinds of threats and how they effect on causing errors through training and systems through TEM training. Threats originate but require their attention and management in order to maintain adequate safety margins.

Pre-departure and taxi phase is the busiest phase of the flight for airline threats, and the approach and landing phase is the highest occurrence rate of the mismanagement.

There are average 4 threats per flight recently in 10 LOSA airlines according to TLC(The LOSA Collabourative). Most frequent threats are adverse weather (26% of all threats) and ATC (21% of all threats).

12% of threats were mismanaged and linked with errors or undesired aircraft states. Around 5 percent of the operational time pressure is mismanaged and linked to flight crew error.

2.2 Threat categories

There are environmental threats and airline threats. 2/3 was environmental threats and 1/3 was airline threats. 44% of environmental threats occur in Des/App/ Land and 72% of airline threats occur in pre-departure according to TLC.

Environmental threats are adverse weather, ATC events, terrain, traffic, and airport conditions. Airline threats are operational time pressure, cabin events, maintenance events, A/C malfunctions, MELs, ground events, dispatch events, ground crew events and etc.

These facts are shocking that so many threats occur before even the aircraft has not departed. This shows that the operation environment these days are much complex situations and giving many threats for the crew to manage. The airlines are able to improve safety when crew know these threats and manage the threats through TEM.

2.3 Airline Operational time pressure threats

Most flight deck crew has thought that on-time operation is part of their routine job and delay is not important to manage effectively regarding operational time pressure threats. There are pressure on airline emploee to maintain on-time operations to perform in timely manner. There is a risk that on time operation pressure and may increase human error. If we do not manage threats and errors, these will induce another errors, undesired aircraft state or accident.

It is noted that around 17% of the flights could not keep on-time operation in one particular sample airlines during two months in 2004. 52% of delayed flights were occurred from home base operations. 5% of the delayed flights were occurred during taxing due to traffic and 2% of delayed flight occurredduring cruise due to heavy head wind.

2.4 The cause of the departure delays

It is important to collect data regarding the operational time pressures to improve these threats in the system. It is useful to share data and information of other airlines or organizations such as FAA, IATA, ICAO and LOSA archives.

- Figure4: The cause of the delays and percentages of delayed departures out of 34 delayed depatres.

The cause of delay	percentage
Late boarding	20%
Aircraft connection	41%
ATC delay	5%
Maintenace	8%
Wether	2%
Ground crew	17%

Some of the late boarding were related with tight secutity measures, group travelling passengers, late arrival of passengers and de-boarding of the passengers.

The highest delay causal factors were the late arrival of the connecting aircraft. Some of the cause from ground crew were double seats, late cargo loading, late catering, late cleaning, and spot change.

3. The Errors and undesired aircraft states

3.1 The Definition of 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. The pilots are trained to trap and avoiderrors. However, we make errors in the cockpit, because we are human and human is not perfect.

There are more than 3 errors per flight in recent LOSA airlines according to TLC. Over 90% of flights had observable crew errors, and around 30% of errors are intentional noncompliance (Violations). Over 25% of the flights had mismanaged error that leads to an additional error or undesired aircraft states. Most often mismanaged errors are Aircraft handling during hand flying, speed and vertical deviations, decision errors and automation errors. Around 50% of the errors went undetected.

3.2 THE NATURE OF FLIGHT CREW ERROR

- Intentional Noncompliance, violations; Performing a checklist from memory
- Procedural; Followed procedures but wrong execution-Wrong heading setting dialed into the MCP
- Communication;Missing information or misinterpretation. Miscommunications with ATC Communication
- Decision; Decision that unnecessarily increased risk-Unnecessary navigation through adverse weather

3.3 The errors of operational time pressure.

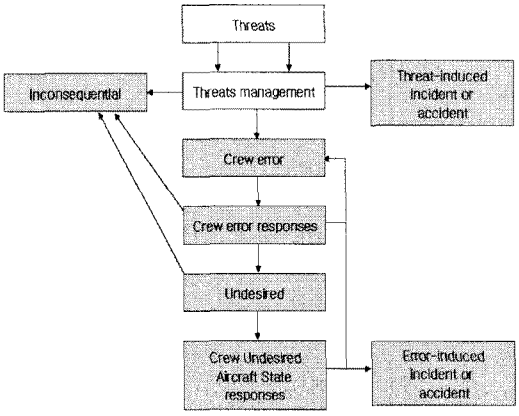
The data shows that there are 19% of errors increased in delayed flight than the normal flight. 5% of operational time pressure threats were mismanaged and linked with errors. Around half of the operational time pressure threats were not effectively managed.

3.4 TEM (Threat and Error management)

TEM has been introduced to the aviation to inhance crew resource management to reduce human making mistakes. Here are some useful method to prevent accidents using TEM.

- Crew must mange operation complexity, the threats just as flying
- To avoid error completly is impossible, so manage own error.
- Manage aircraft deviation

Each crew must use TEM as personal risk asessment tool according Don Gunther in ICAO TEM conference 2006.



- Figure3. TEM model by ICAO

3.5 UNDESIRED AIRCRAFT STATES

Undesired aircraft states (UAS) is a flight crew induced aircraft state that clearly reduces safety margins. Most often mismanaged undesired aircraft states is unstable approaches or speed deviations in descent / approach / land. Over 25% of the flights had mismanaged errors that lead to an additional error or undesired aircraft state according to TLC.

Some examples of undesired aircraft states are incorrect a/c configurations, vertical deviations of altitude, lateral deviations of heading, speed too high, speed too low, or abrupt aircraft handling.

The data shows that there are 12 percent of undesired aircraft states increased in delayed flights than the normal flight.

4. CONCLUSIONS

Over 15% of flights have encountered operational time pressure threats. 5% of operational time pressure threats were linked with errors. Around half of the operational time pressure threats were not effectively managed.

We believe TEM can help management to train and set up the system for crew to manage threats, avoid committing errors, manage their errors, and manage undesired aircraft states, because we know these errors through audits and reports.

It is critical to identify hazards and risks within the airlines in flight operations to maintain safety management system working in progress. We find that it is cheaper to prevent the accident using tools to maintain effective safety management systems than an accident.

Threats and errors can be used as great tool to implement crew resources management effectively. We can eliminate these threats and errors within the safety management system. We experience that threats and errors managements provide airline to fly the aircraft safer to our destinations to manage threats and errors effectively.

Here are some useful recommendations regarding the operatioal time pressure threats.

- If distracted by others, return to the beggining of the procedures not to omit or forget the items. Inhance more structured procedures for the checklist usages
- To train including pre-departure threats exercise in LOFT senarios.
- Advise the crew on the MEL items in advance , and train the MEL application.
- To strenghten pre-departure briefing to effectively manage the threats.
- Maintain effective crew coordination and situation awareness for the predeparture phases.
- Introduce workload management and inhanced SOP for pre-departure threats. It is essential to perform unimportant items when you have time, so you can manage workload.
- Enhance English to handle maintenance, ground handling, flight plan, refueling, and ATC effectively in Non-Korean speaking environment, overseas airports.

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