

Adaptation of Line Operations Safety Audit (LOSA) to Dispatch Operations (DOSA)

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Abstract

Purpose: Dispatch Operations Safety Audit (DOSA) is a proactive and predictive method in safety management system that detects the capabilities and pitfalls of dispatcher performance. In this study, Dispatch-Line Operations Safety Audit is carried out in an airline and results are analyzed and discussed.

Design/methodology: The method of DOSA implementation for flight operations officers is similar to LOSA for flight crew.

Findings: Results show that DOSA has an important effect on Threat and Error Management (TEM) in the Operations Control Center (OCC).

Originality/value: Potential applications of this research include the better threat and error management in OCC with the implementation of DOSA as well as identification of threats and errors types for FOOs in OCC. Also, distribution of threats and errors in different phases of dispatch shift is discussed, therefore syllabuses of training courses can be provided with respect to threat and error types for flight operations officers.

Keywords: Safety Management System (SMS); Human error analysis; Analysis of safety data; Safety audit; Dispatch-LOSA.

1. Introduction

Currently, the safety management system is a necessary system for the aviation industry. Regarding hazard identification, three methods are identified to capture safety data: Reactive, Proactive and Predictive methods. The three methods depend on seriousness of the consequences of the triggering event. The reactive method concerns with the past events. The proactive method involves actively seeking hazards in the existing processes, and the predictive method deals with gathering data and actively seeking hazards in the future (ICAO, 2013).

Identifying active failures and latent conditions is a critical aspect for any organization involved in high-risk operations. The active failures and latent conditions are related to errors and threats, respectively (Thomas, 2004). Threat and Error Management (TEM) is a method to determine the high-risk hazards.

Threats are out-of-control external conditions for Flight Operations Officers (FOOs) which must to be managed. They are categorized into two types: environmental threats and airline threats, each of which can be either expected or unexpected. They have the potential to compromise safety. The expected threats include adverse weather or aircraft malfunctions, which can be anticipated by the FOOs. The unexpected threats include for instance the crew scheduling errors. In this situation, there is no warning for the FOOs in advance. The environmental threats are related to outside of the airline, such as errors of ATC, SITA flight planning and etc. The airline threats are attributed to the airline personnel or conditions as well as airline and aircraft events such as aircraft Limitation / MEL, cabin crew, maintenance errors and etc.

Errors are FOO actions or inactions which lead to deviations from their organizational intentions or expectations (Klinect, 2005). The errors of FOO are categorized in two types: technical errors and non-technical errors. The technical errors are caused by ignorance or violation of regulations and documentations while the non-technical errors consist of communication, morality or Crew Resource Management (CRM) errors. Furthermore, sources of errors are three types: spontaneous, related threats and error chain leading to additional errors. Most errors are managed routinely while some may provoke new error or Undesired Flight Dispatch State (UFDS) (Helmreich, Klinect & Wilhelm, 1999).

UFDS is a FOO error-induced aircraft state that clearly reduces the existing safety margin. UFDSs are two types: deviation of flight implementation and incorrect data or information. Their only source is undetected or mismanaged FOO errors (Klinect, 2005).

In order to identify threats and errors to decrease the occurrence of accidents and incidents and keep them at an acceptable level of safety, the safety system needs to shift from a reactive mode to proactive

and predictive ones. The annual proficiency check is a proactive method in the Operations Control Center (OCC) which is punishable for the FOOs.

The interest in research to improve performance of personnel in OCCs has increased rapidly over the last decade. The effect of different decision making processes by controllers was applied in six airline OCCs in the paper by Bruce (2011). Bouarfa et.al studied the different coordination policies between OCC and other sections of airline (Bouarfa, Blom & Curran, 2016).

The Line Operations Safety Audit (LOSA) is a proactive and predictive method for data collection in normal flight operations which improves the flight crew performance (ICAO, 2005). Its methodology is indorsed by the International Civil Aviation Organization (ICAO) for monitoring flight crew performance. It provides a tool for collecting data; the acquired data is not the final step; the organization must analyze the data and discover problems in order to react in the best manner to improve safety. DOSA is the adaptation method of LOSA to improve FOO performance.

LOSA began in 1991 as a human factor research project in the University of Texas at Austin (ICAO, 2002). In the next decade, its utilization became wide spread in many regional and international airlines (Australian Transport Safety Bureau, 2009; Klinect, Murray, Merritt & Helmreich, 2003; Klinect, Willhelm & Helmreich, 1999; Murray, 2005; Merritt & Klinect, 2006).

In 2007, LOSA application to single pilot operations (LOSA: SP) was accomplished in New Zealand to decrease the incident and accident rate (Earl, Peregonzalez & Frey, 2007). The Guild of Air Pilots and Air Navigators (GAPAN) conducted a series of TEM courses in Australia in 2008/9 for pilots involved in low capacity public transport and single-pilot operations (Earl, Murray & Bates, 2011).

The LOSA was developed in other areas with equally positive results such as Air Traffic Control (Normal Operations Safety Survey (NOSS)) (Henry, 2007), the military (Mission Operations Safety Audits) (Burdekin, 2003), the Queensland Rail (Confidential Observations of Rail Safety-CORS) (McDonald, Garrigan & Kanse, 2006), apron (ramp) and maintenance operations (Ma & Rankin, 2012) which were all completed successfully.

In 2005, Continental Airlines implemented the first DOSA by three dispatcher observers. The results of DOSA look really promising, although they are not published in detail (Flight Safety Foundation Editorial Staff, 2008).

In 2009, the first LOSA was begun in Iran Air. From 2009 to 2015, three LOSAs were implemented in Iran Air for flight crew monitoring. LOSAs were undertaken on all fleets including short and medium

hauls as well as domestic and international routes for all fleets. Results were published by Khoshkhou, Goodarzi and Sharafbafi (2011, 2013).

Regarding the successful results of the three LOSAs, the Flight Safety Department in Iran Air decided to launch the first DOSA in 2015. In this study, the results of the first DOSA in Iran Air are analyzed and discussed.

2. DOSA Implementation Method

In this DOSA, the steering committee was held by safety FOOs of the OCC and some of the Flight Safety Department experts. The committee identified program goals. The main goal was to decrease the number of technical and non-technical errors. Factors such as incorrect paperwork, briefing and radio communication were defined as technical errors and FOO-FOO communications, FOO-external sources communications and FOO-flight crew communications were defined as non-technical errors. All types of errors are surveyed in this paper.

The first significant step in implementing DOSA was cultural activities which have been achieved through massive advertising such as issuing banners, posters, bulletins and memos about DOSA to inform all FOO in OCC and associated departments.

The DOSA bulletin consisting its summary and process was located at the dispatch briefing center two months prior to the project. The other task was issuing a managing commitment which explains the overall purpose of DOSA for FOOs and the fact that all observations own non-punitive nature. The documents were prepared one month before and signed by the Director of operations control center. The methodology of DOSA was similar to LOSA. The observers were selected and trained about the targets and their tasks.

The DOSA observation form was designed according to activities and hazards of FOOs. The patterns of threat, errors and undesired flight dispatch states are identified by the DOSA steering committee. The format of observation form was based on modification of the LOSA form in the advisory Circular (Federal Aviation administration, 2006). Threats, errors and UDFSs was relating to all sections of the OCC.

The DOSA process was implemented in Iran Air based on ten operating characteristics (Klinect et al., 2003). The total number of FOO personnel's in the OCC was 28. Overall DOSA observations were 36. The dispatch observation length range was between 10 to 12 hrs.

DOSA implementation was based on Advisory Circular (Federal Aviation administration, 2006) and Line Operations Safety Audit (LOSA) documents (ICAO, 2002). The observed data was collected during two months. Then after, the data processing phase (second phase) was begun by the DOSA steering committee. They checked and then used them as input in the related data software for analyzing. In the third step called feedback phase, the DOSA steering committee studied the goals for improvement. Finally, all results, conclusions and goals were published as a report and sent to all relative functional managers and training directors. Besides, we published our findings in the flight safety magazine for FOOs.

3. Results

In the following section, DOSA threats and errors are presented. Results are divided in two sections; in the first section, external threats are shown and in the second section, FOOs errors are surveyed and analyzed.

3.1 External threat results from DOSA

In the following section, results of external threats of DOSA are presented. The DOSA data in Table 1 shows that the number of threats can vary between dispatch shifts. Over 88% of dispatch shift contained at least one external threat. The average and maximum numbers of external threats were 2.22 and 4 per dispatch shift, respectively.

Total External Threats	80
Percentage of Dispatch Shift at Least One External Threat	88.89%
Average External Threats per Dispatch Shift	2.22
Most External Threats in one Dispatch Shift	4

Table 1. General external threat results

Data in Table 2 exhibits the distribution of threat types. It is obviously visible that the most occurring external threats were airline threat including building / workspaces followed by airline operational pressure and ground maintenance. Over 70 percent of threats were managed by FOOs. The operational pressure of FOOs could lead to their error.

Threat Type		Percentage of Threats of DOSA	
Enviromental Threat	CAO (Regulations, NOTAM, ...)	5.00 %	5%
Airline Threats	Buildings / Workspaces	40.00 %	95.00 %
	Airline Operational Pressure	30.00 %	
	Most External Threats in one Dispatch Shift	10.00 %	
	Others	15.00 %	

Table 2. Distribution of external threat types

The DOSA data in Table 3 shows the percentage of external threats in each phase of dispatch shift. The highest percentage of external threats occurred in the general action phase followed by pre-flight phase. This table shows that about 55% of all threats took place during the general action and 25% during the pre-flight phase. General action was defined as a condition which is not related to flight issue.

Phase of dispatch shift	Percentage of External Threats of DOSA
Pre-Flight	25.00 %
During Flight	15.00 %
Termination of Flight	5.00 %
General Action	55.00 %

Table 3. External threats by phase of dispatch shift

3.2. Error results from DOSA

The data in Table 4 shows the total number of FOO errors in DOSA. Over 88 percent of dispatch shifts in the database included errors. In some cases, the number of FOO errors increased to 16 errors per dispatch shift. The average number of errors was 4.22 / dispatch shift.

Total Errors	152
Percentage of Dispatch Shift at Least One Error	88.89 %
Average number of Errors per Dispatch Shift	4.22
Most number of Errors in a Dispatch Shift	16

Table 4. General result of FOO errors

Table 5 shows the distribution of error types in DOSA. The distribution of error types can change from a shift to the other. It is clearly shown that most technical errors with prevalence of at least one error per shift were related to lack of radio communication followed by lack of flight monitoring, lack

of shift change briefing and insufficient analysis of NOTAM, respectively. The most frequent type of non-technical error was FOO-FOO communication which seems to be related to the high work load pressure of the dispatch personnel.

Error Type		Percentage of Dispatch Shift at Least One Error in DOSA
Technical error	Lack of Radio Communication	44.44 %
	Lack of Flight Monitoring	33.33 %
	Lack of Shift Change Briefing	33.33 %
	Insufficient Analysis of NOTAM	22.22 %
	Insufficient Briefing to Crew Others	22.22 %
Non-technical error	FOO to FOO Communication	22.22 %
	FOO to Crew Communication	11.11 %
	FOO to External Communication (Other Personnel/ Departments)	11.11 %

Table 5. Distribution of error types regarding DOSA

Table 6 shows the percentage of each FOO error types. Results reveal that most error types are technical errors. The most repetitive technical error included lack of radio communication followed by lack of flight monitoring, lack of shift change briefing and insufficient analysis of NOTAM, respectively. The most frequent type of non-technical error is related to FOO-flight crew communication preceded by FOO-FOO communication, respectively. It seems that non-technical errors can decrease with training CRM for the FOOs and changes in the syllabus of their according to the results.

Error Type		Percentage of Dispatch Shift at Least One Error in DOSA	
Technical error	Lack of Radio Communication	18.42 %	81.58 %
	Lack of Flight Monitoring	15.79 %	
	Lack of Shift Change Briefing	13.16 %	
	Insufficient Analysis of NOTAM	7.89 %	
	Others	26.32 %	
Non-technical error	FOO - FOO Communication	5.26 %	18.42 %
	FOO - Crew Communication	10.53 %	
	FOO - External Communication (Other Personnel/ Departments)	2.63 %	

Table 6. Percentage of error types of FOOs

Table 7 exhibits the distribution of FOO errors in each phase of dispatch shift. It is obvious that the pre-flight phase and then the during flight phase have the most errors in dispatch, respectively. About

47 percent of all observed errors occurred during the pre-flight phase while approximately 26 percent happened in the during flight phase.

Phase of dispatch shift	Percentage of Errors of DOSA
Pre-Flight	47.37 %
During Flight	26.32 %
Termination of Flight	10.53 %
General Action	15.78 %

Table 7. Distribution of FOO errors by phase of dispatch shift

Data in Table 8 shows the distribution of managed and mismanaged errors. Over 52 % of the errors are managed by FOOs. Only 22 percent of errors were consequential and linked to additional error or UFDS.

Error Management	Percentage of Errors of DOSA
Managed	52.63 %
Mismanaged	47.37 %

Table 8. Distribution of managed and mismanaged errors by FOOs

4. Conclusions

In this study, the results of DOSA in Iran Air airline are surveyed. Recent investigation shows that DOSA similar to LOSA can detect the capabilities and pitfalls of the operational performance for dispatch. Also results show that it is a successful way to identify and detect threats and errors in normal dispatch operations. DOSA will provide a proactive and predictive safety system in OCC and it reveals the potential to increase the safety margin.

The results exhibited that the major portion of external threats were the airline threats (more than 95 percent). The airline operational pressure of FOOs could lead to FOO errors. The highest percentage of external threats occurred in the general action phase followed by in the pre-flight phase, respectively.

Results showed that most error types were technical error. The most repetitive technical error included lack of radio communication followed by lack of flight monitoring, lack of shift change briefing and insufficient analysis of NOTAM, respectively. The pre-flight phase and then the during flight phase comprise the most number of errors in dispatch, respectively.

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