Analysis of the Runway Overrun and Runway Excursion Based on TEM Model

Jianjun Chen [a], Xu Zhang [b,*], Ming Zhao [c], Yan Xia [d]

School of Air Transportation, Shanghai University of Engineering Science, Shanghai 201620, China.

[a]chen8023miss@163.com,[b]zx_sues@163.com, [c]jmmolly_zhao@163.com,

[d]18016002245@163.com

Abstract

In order to enhance the safety management of the aircraft operation process, reduce the probability of aircraft takeoff and landing out of runway overrun and runway excursion events. The use of threat error management (TEM model) to analyze the aircraft runoff event statistics, to find out the cause of the runway overrun and runway excursion event is very important, but also for civil aviation regulatory agencies, airlines, flight crew and other related The staff provided valuable advice on the development of more detailed precautions.

Keywords

Safety management; TEM model; Runway overrun;Runway excursion.

1. Introduction

It is understood that the aircraft slipped out of the runway after the slide out of 3 minutes and the aircraft before landing 8 minutes is the most prone to the accident stage, which 11 minutes is called "dangerous 11 minutes".According to the International Air Transport Association statistics, the 2010 global aviation accident in the runway overrun and runway excursion events accounted for the total number of accidents 21%, ranking first.According to the Civil Aviation Safety Information Network, from 2005 to 2010, China's civil aviation has 87 serious accidents, of which 25 aircraft runway overrun and runway excursion, accounting for about 29% of serious accidents, and much higher than other category[1]. Therefore, the aircraft runway overrun and runway excursion events is a serious impact on the safety of aircraft operating the main reason for its in-depth study has a strong practical significance.

The threat of error management (TEM model) is one of the factors of safety in the event of environmental condition, the performance of aircraft, such as the analysis model, it is a comprehensive application of human factors knowledge in practice, to further improve the aircraft operation safety margin, is a safe and effective analysis tool.Most security incidents occur under the combined effects of threats and errors.Threats (T) are divided into environmental threats and organizational threats[2]. Error (E) is divided into operation error, program error, communication error.Therefore, the use of TEM model of China's civil aviation missed runway events to analyze the cause of the incident and the development of preventive measures of great significance.

2. Analysis of Threat Factors in Runway Overrun and Runway Excursion

Select 60 civil aircraft from the runway overrun and runway excursion events between 1990 and 2015, and use the threat(T) factors in the TEM model for statistical analysis. As shown in Figure 1 below,

among the events of 60 in runway overrun and runway excursion, the environmental threat accounted for 49 cases, the organizational threat accounted for 12 cases.

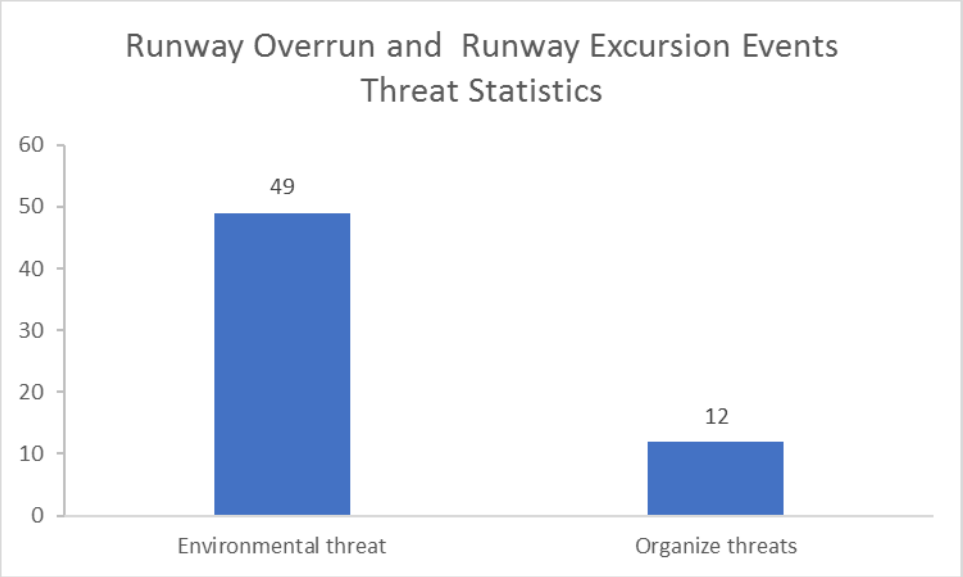

Fig. 1 Runway Overrun and Runway Excursion Events Threat (T) Statistics

As shown in Figure 2 below, Among the threat (T) factors in the TEM model, environmental threats accounted for 86% and organizational threats accounted for 14%.

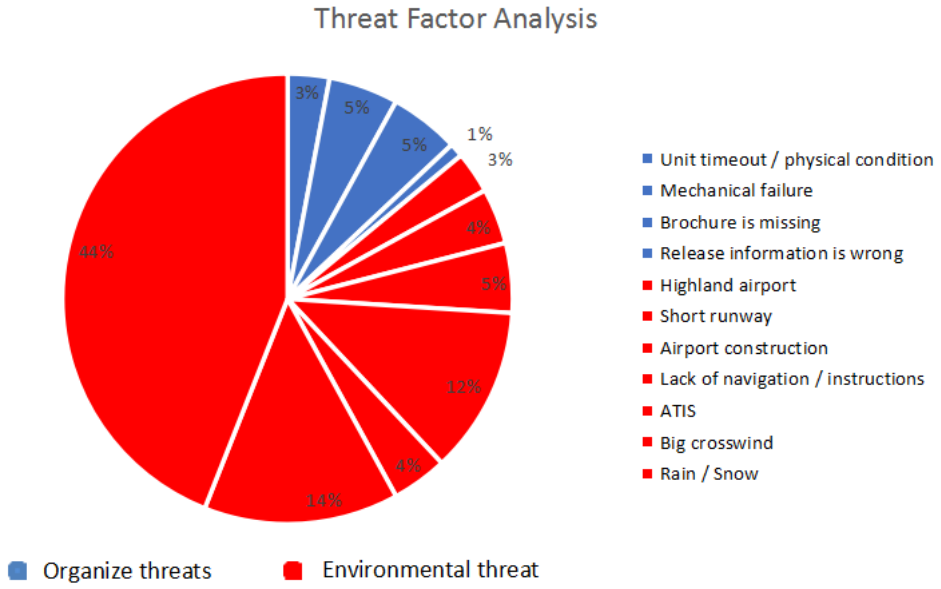

Fig. 2 Threat (T) Factor Analysis

Through the analysis of the threat factors, we can see complex meteorological conditions, lack of airport hardware is caused by the aircraft missed the primary threat of the runway overrun and runway excursion events.

In the case of man-made can not change the complex meteorological conditions, to reduce the runway overrun and runway excursion occurred, it is necessary to proceed from the safety awareness of the unit to strengthen safety education, requiring each pilot can be in strict accordance with CCAR- 91 "general operation and flight rules" requires the implementation of the mission, and resolutely implement the "eight of the one against" provisions, put an end to blind recklessness, to prevent chances.

The airline should sort out all flights at special airports, complex airport routes, carry out adequate risk assessment, and develop appropriate risk control measures to carry out appropriate warnings to pilots before the flight, so that pilots can do the risks Good preparation in advance[3].

For airports with insufficient airport hardware conditions, such as lack of runway centerline guide lights, lack of visibility tester, high altitude runway length of the airport, it is recommended to increase economic input, as soon as possible to complete the facilities and equipment modification[4]. Civil aviation units should firmly establish the concept of safety is the potential benefits, through doing a good job to improve the safety of economic work.

3. Analysis of Error Factors in Runway Overrun and Runway Excursion

Select 60 civil aircraft from the runway overrun and runway excursion between 1990 and 2016, and use the Error(E) factors in the TEM model for statistical analysis. As shown in Figure 3 below, the operating errors accounted for 48 cases, the procedure errors accounted for 13 cases, and the communication errors accounted for 5 cases .

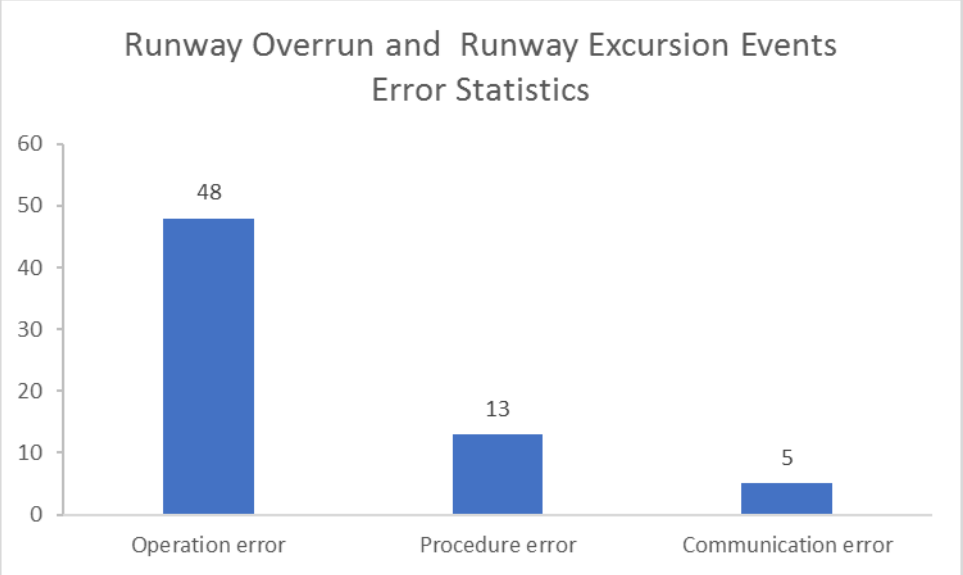

Fig. 3 Runway Overrun and Runway Excursion Events Error (E) Statistics

As shown in Figure 4 below, Among the error(E) factors in the TEM model, operating errors accounted for 73%, procedure errors accounted for 21%, and communication errors accounted for 6%.

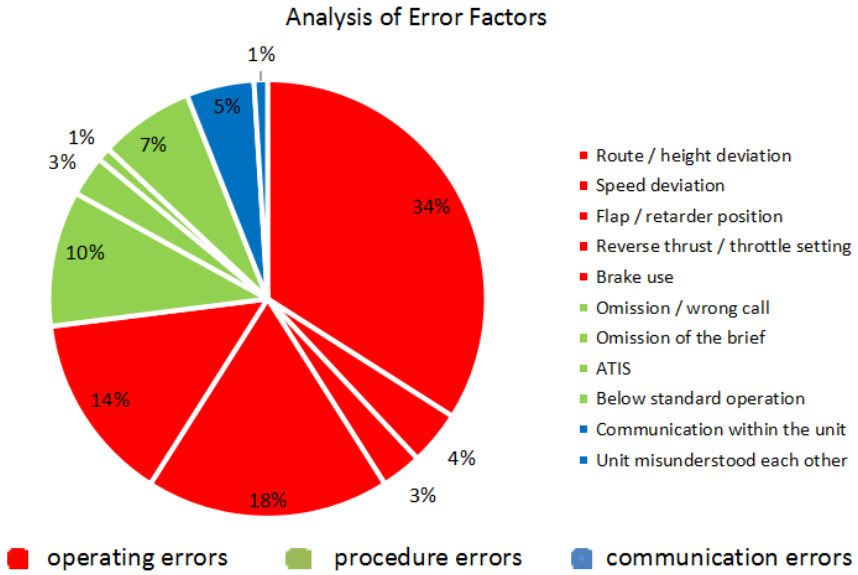

Fig. 4 Analysis of Error (E) Factors

By analyzing the error factors, it can be seen that the operational error is the highest proportion of the erroneous factors in the runway overrun and runway excursion events, which reflects the lack of operational skills and flight style of the pilot[5].

In view of the lack of pilot operating skills, the company in the usual pilots training, should be targeted to strengthen the special training to strengthen the large crosswind, heavy rainfall in the pilots on the attitude of the deviation from the trend of the ability to master, The use of the time, clearly in the complex weather captain must take over the provisions of personal operation, to prevent the carelessness, reduce the occurrence of operational errors.

In view of the pilot flight style, the company should let each pilot set a "safety first" thinking, establish a sound safety management system[6]. So that each pilots have a "red line awareness, the bottom line of consciousness", strong grasp of style management, violation of the "eight of the opposition" security line of serious behavior, so that each pilot to develop good operating habits, to ensure that the key Always give full play to the system and manual security function.

By combining program improvement, cockpit optimization and crew awareness training, to reduce the chances of the runway overrun and runway excursion events. When the unit is aware of the situation and has effective control of the situation, they can make effective and timely decisions to ensure safety.

4. Conclusion

In recent years, civil aviation unsafe events occurred again and again, indicating that the construction of civil aviation safety system long way to go. In this paper, the TEM model of the typical unsafe event analysis, can be found in many aspects of the outstanding problems.

A lot of ideological paralysis, the existence of defective technology pilots, in flight arbitrarily large, special handling of weak operational capacity, the implementation of the company operating manual and civil aviation rules and regulations are not strict.

In view of the technical problems of the pilot, the company failed to organize effective training to correct its problems, usually there is a passing phenomenon, resulting in some wrong behavior has become a common phenomenon and long-term existence[7]. Flight training should focus more on "standardized" training based on the information and recommendations in the training manual, but very few special cases still need attention to flexibility. Through training, pilots are aware of and fully understand the many factors that affect flight.

The implementation of the rules and regulations are poor, the general concept of flying officers and regulations, the lack of awareness of the safety of the bottom line, resulting in more than the minimum height of the loss of visual reference circumstances, still blindly approach the incident[5].

Many unsafe events seem to be caused by improper operation and irregularities on the surface, but simply looking for reasons from the crew, can not fundamentally solve the problem, because the soil is still unsafe[8]. We should reflect on the problems in the organizational system, from the fundamental understanding of the safety management system on the flight operation of the important role of security.

Resulting in a wide range of factors scattered, the weakness of any factor still can not solve the relatively large out of the runway problem, need to take more than one solution. In the application of TEM model, we should focus on finding some security risks in the organization and management, through the security system construction, improve the rules and regulations, technical personnel training and other means to build an effective security defense network, the maximum reduction of insecurity happened.

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