

台鐵營運安全風險標準之研究

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摘 要

台鐵目前經營台灣最主要的城際軌道運輸系統，若發生事故將影響台鐵營運與形象。在交通部有意建立軌道安全風險管理及安全評估方法之前提下，本研究乃根據民國 86 年至 90 年之台鐵事故資料，研訂台鐵應把握之安全風險標準。

本研究依據事故主客體間的關係將台鐵之事故重新分為五大類：(一)列車出軌或翻覆、(二)列車相撞、(三)列車與汽機車碰撞、(四)列車撞及人、(五)個人事故。加入事故之地點因素之考量後，使台鐵五年之事故資料均可歸類，並依此分類結果計算台鐵各類事故之安全風險值、風險貢獻度及繪製五大類事故樹狀圖。根據五大類事故樹狀圖擬定各類事故之改善策略並製作專家問卷，透過專家問卷獲得大部分改善策略之成本與效益。在重新估計部分效益及修正時間基礎後，即進行成本效益之計算，並可將各項改善策略以 B/C 之高低排序。然後考量四種不同的安全風險標準之訂定準則，計算出四個不同的台鐵安全風險標準值，納入台鐵現況風險值後可繪出台鐵安全風險評估三角形。最後與其他運具之安全風險水準及台灣地區十大死因之死亡風險進行比較，即可了解台鐵之相對安全程度。

本研究得到台鐵現況總風險值為 5.8786 等值死亡人數/MVK；以成本效益為考量之台鐵安全風險標準值為 5.2892 等值死亡人數/MVK；以台鐵權限內可執行考量之台鐵安全風險標準值為 5.8460 等值死亡人數/MVK；台鐵不可忍受風險臨界值為 5.5172 等值死亡人數/MVK；台鐵可忽視風險臨界值為 0.2703 等值死亡人數/MVK。與其他運具相較，台鐵之安全風險值遠低於高速公路；重型國籍民用航空器之安全風險值較台鐵高，輕型國籍民用航空器之安全風險值與台鐵相當。除非台鐵發生有責之重大行車事故，否則台鐵之傷亡風險均小於台灣地區十大死因之死亡風險。

關鍵詞：鐵路營運安全、風險標準、風險水準比較

A Study of Risk Standard of Operational Safety for TRA

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ABSTRACT

Taiwan Railway Administration (TRA) operates the primary rail system of intercity transportation in Taiwan, any accident happened on TRA will affect operation and image. Since Taiwan's Minister of Transportation and Communications (MOTC) wants to develop the risk management of rail safety and the safety estimation, this study will define the risk standard of operational safety for TRA, based on the accident data from 1997 to 2001.

The accident data is classified to five categories according to the relationship between the parties of accident : (1)Derailment or Overturn, (2)Crash, (3)Train colliding with motor vehicle, (4)Train colliding with human, and(5)Personal accident. In connection with the accident location, all accident data can be classified, thereby we can estimate risk value of safety and contributing degree for each type of accident, and plot event tree of five accident categories. Based on the event tree, we can draft improvement plans for each accident type and make expert surveys. From most of those surveys we can gain the benefit and the cost of improvement plans. After re-estimating the benefit of some improvement plans and correcting the time basis, we can calculate B/C thereby putting improvement plans in sequence. Considering established standards of four different criteria of safety, we can calculate four different values of risk standard for TRA, and bring into those values to plot the risk triangle of TRA. Comparing with the risk standard of other modal and the leading causes of death in Taiwan, we can finally understand the relative safety level of TRA.

From our calculation, the current risk value of TRA is 5.8786 Equivalent Fatalities/Million Vehicle Kilometers (MVK), the standard risk value of safety for TRA in consideration of B/C is 5.2892 Equivalent Fatalities/MVK, the standard risk value of safety in consideration of the limits of authority is 5.8460 Equivalent Fatalities/MVK, the intolerably critical risk value is 5.5172 Equivalent Fatalities/MVK, the negligibly critical risk value is 0.2703 Equivalent Fatalities/MVK. Compared with other modal, the risk level of safety for TRA is much lower than the national freeway in Taiwan, lower than the heavy civil aviation aircraft registered of Taiwan, and almost equal to the light civil aviation aircraft registered of Taiwan. Besides, unless serious accident happened, the risk of TRA is lower than that of leading causes of death in Taiwan.

Keyword : railway operational safety, risk standard, risk level comparison