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Rail Human Factor Training: Adaptation of Crew Resource
Training in KCRC to Enhance Modern Railway Safety

A thesis presented in partial fulfilment of the requirements
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Abstract

Abstract of thesis entitled:

**Rail Human Factor Training: Adaptation of Crew Resource Training in KCRC to Enhance Modern Railway Safety**

Authored by Tak Sum Tsang

Recent world headline disasters such as the September 11 attacks, 2005 London transport bombings and 2003 Daegu Subway arson attacks sent a strong warning to all nations that mass-transit systems are highly susceptible to arson or terrorist attacks with catastrophic consequences. Whilst it may be impossible to ever eliminate all forms of threats, one thing remains clear- the effectiveness of crew response to emergency situations can make a key difference between a minor incident and a full blown disaster.

Staff effectiveness relies upon corporate awareness, training and investment into safety. Even a state-of-the-art system requires suitably matched and experienced staff for smooth, efficient and incident-free operation.

Unfortunately, incident reports reveal consistently that about 70% of aviation and railway incidents have roots in human factors, highlighting the need to invest in
effective, safety-oriented training to expose staff to operational and emergency situations in order to minimise or mitigate human error consequences.

In aviation, crew resource management (CRM) was developed to address this need. CRM’s effectiveness in improving teamwork, communication and staff response to emergency results in its popularity in the medical, nuclear, and military sectors. Although some work had begun to modify CRM for the railway industry, none yet existed in China or Hong Kong. Having observed the effectiveness of CRM and line oriented training (LOT) in aviation, this work documents the introduction of CRM and LOT in Hong Kong in the West Rail (WR) division of the Kowloon-Canton Railway Corporation (KCRC).

One-hundred-and-twenty drivers, station and traffic controllers from WR took part in a three days CRM training program. The program used lectures, video aided training facilities (VAT) and integrated training facilities (ITF) to expose staff to CRM and safety related concepts. ITFs were used in LOT programs to simulate emergency and abnormal operation scenarios to test and train ability of teams to handle such situations. Feedback was provided by computer, video and voice records, and trainer comments.
The effectiveness of the training program was tested in an emergency drill in conjunction with Hong Kong police, fire and hospital services by comparison of a control group and the CRM trained group to evaluate the program effectiveness. It was observed that the CRM group displayed better incident handling capabilities, stronger teamwork and communication throughout the exercise. When analysing incidents, CRM trained members were able to recall and consider more factors of human performance.

As the instituted CRM program is still in its infancy, more time is required to prove its effectiveness. It is believed that even in this short introduction period it has raised staff awareness of safety and human factors, and improved overall teamwork and performance in WR. Now that WR serves as a knowledge portal to the rest of KCRC divisions, it is envisioned that CRM will be extended to other KCRC rails. In later years it may also broaden to intercity rails to Mainland China to improve staff performance. An effective CRM program will be the key to minimise impact and consequences if one day disaster does strike.
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# Table of Contents

ABSTRACT .................................................................................................................. I  
ACKNOWLEDGEMENTS ........................................................................................ I  
TABLE OF CONTENTS ........................................................................................ II  
LIST OF FIGURES ................................................................................................... VI  
LIST OF TABLES ................................................................................................... VII  

CHAPTER 1. INTRODUCTION ............................................................................... 1  
  1.1 Background on CRM .......................................................................................... 2  
  1.2 Outline and Scope .............................................................................................. 3  

CHAPTER 2. INTRODUCING CREW RESOURCE MANAGEMENT .............. 4  
  2.1 Aviation Experience on Line Oriented Training (LOT) and Crew Resource  
     Management (CRM) .......................................................................................... 4  
  2.2 The Birth of Crew Resource Management (CRM) ............................................. 4  
  2.3 CRM Design and Structure ............................................................................. 8  
  2.4 CRM Objectives .............................................................................................. 9  
  2.5 CRM Training Phases ..................................................................................... 10  
  2.6 Guiding Principles for CRM Training .............................................................. 13  
  2.7 Line Oriented Flight Training (LOFT) ............................................................ 14  
  2.8 Importance of CRM and LOT programs ......................................................... 16  
  2.9 Justifications for Crew Resource Management in KCRC ................................ 18  

CHAPTER 3. LITERATURE REVIEW ON HUMAN FACTOR ....................... 20  
  3.1 Introduction ...................................................................................................... 20  
  3.2 Human Factor Distinctions ............................................................................ 21  
  3.3 The Swiss Cheese Model ............................................................................... 23  
  3.4 Examples of Human Factor Errors .................................................................. 25  
  3.5 Two Ways of Looking at Human Error .......................................................... 27  
  3.6 The Bad Apple Theory .................................................................................... 28  
  3.7 The New View on Human Error ..................................................................... 31  
  3.8 Managerial Error ............................................................................................ 32  
  3.9 The Importance of teamwork in the Railway Industry .................................. 35  
  3.10 Factors that influence training Success ........................................................... 36  

CHAPTER 4. THE NEED FOR SAFETY ORIENTED TRAINING IN  
RAILWAY INDUSTRY ............................................................................................. 39  
  4.1 Problems encountered in the Railway Industry .............................................. 41
4.2 Experience Erosion over Time .................................................. 42
4.3 Situation Awareness ............................................................. 45
4.4 Teamwork Effectiveness .......................................................... 46
4.5 Identifying areas of training needs ........................................... 47

CHAPTER 5. ADAPTING CRM AND LOT TRAINING FOR RAILWAY .... 48

5.1 Similarities between Railway and Aviation industries .................. 48
5.2 Adapting CRM and LOT for Railway ....................................... 49
5.3 Interpretation of CRM and LOT in Railway Industry .................. 50
5.4 CRM and LOT Skills to be developed ..................................... 50
5.5 Corporate Training Goals ....................................................... 52
5.6 Training Methods ................................................................. 52

CHAPTER 6. THE CURRENT KCRC SAFETY MODEL ....................... 54

6.1 Introduction to KCRC ............................................................ 54
6.2 Incident responses ............................................................... 56
6.3 Safety Management .............................................................. 57
6.4 KCRC Safety Management System ......................................... 58
6.5 Limits of Safety Management ................................................ 58
6.6 KCRC West Rail ................................................................. 59
6.7 Comparisons between East and West Rail ................................. 60
6.8 Shortcomings of current training needs .................................... 63

CHAPTER 7. TRAINING FACILITIES IN KCRC ......................... 64

7.1 Integrated Training Facilities (ITF) ........................................... 64
7.2 ITF Overview ......................................................................... 66
7.3 Application Approach of ITF .................................................. 68
7.4 Decision Support System (DSS) .............................................. 70
7.5 DSS Design Concept ............................................................ 70

CHAPTER 8. CURRENT TRAIN CREW TASK ANALYSIS .............. 73

8.1 Train Driver Tasks and Criteria of Competence ........................ 74
8.2 Job Descriptions of Senior Traffic Controllers and Train Controllers . 78
8.3 Skill Pattern of Train Drivers/Traffic Controllers ...................... 81

CHAPTER 9. ORGANISATIONAL ISSUES .................................. 84

9.1 Difficulties faced by TOC in reformation ................................. 84
9.2 Organisational budget constraints ......................................... 85
9.3 The importance of Organisation Culture ................................ 87
9.4 Rail Enquiries and proportioning blame ................................... 89
CHAPTER 10. THE PRINCIPLES OF HUMAN FACTOR DESIGN .......... 92
10.1 Ergonomics Design .......................................................... 92
10.2 Human Factor Design ...................................................... 92
10.3 Human Machine Interface (HMI) Design ......................... 93
10.4 Task effectiveness .......................................................... 95
10.5 Train Control & Signalling System Design ....................... 96
10.6 The Trade-Off between Automatic and Manual Driving ...... 99
10.7 The Perspective of Train Driver ......................................... 101
10.8 Rule-Based Instructional Design ........................................ 104

CHAPTER 11. RESEARCH DESIGN ................................................. 107
11.1 Course Design for Human Factor Training ....................... 107
11.2 Defining Objectives ....................................................... 109
11.3 Teamwork Skill Dimensions ............................................ 111
11.4 CRM Training Areas ....................................................... 114

CHAPTER 12. TRAIN SERVICES OPERATING PRINCIPLE ............... 117
12.1 Emergency operations .................................................... 117
12.2 Major Functions of Station Operations ......................... 118
12.3 Incident / Emergency Handling ....................................... 118
12.4 West Rail SOP’s Hierarchy .............................................. 118
12.5 KCRC Rule Book Coverage ............................................. 119
12.6 WR Contingency Manual Coverage .................................. 120
12.7 WR Special Operating Procedures Coverage .................... 122

CHAPTER 13. CRM TRAINING PROGRAM: METHOD .................... 123
13.1 Course Participants ....................................................... 123
13.2 Training Materials ........................................................ 124
13.3 Procedure ................................................................. 124
13.4 Measurement of Effectiveness ........................................ 126
13.5 Statistical Analysis ........................................................ 127
13.6 CRM Training for Train Crew ........................................ 127
13.7 Emergency Drills .......................................................... 131

CHAPTER 14. CREW PERFORMANCE ASSESSMENT ..................... 135
14.1 Immediate post CRM training result- computer records from ITF responses 135
14.2 Performance result- West Rail annual performance results and observations from drills ........................................ 137
14.3 Performance Result of West Rail ...................................... 138
14.4 Staff Commendations ...................................................... 140
List of Figures

FIGURE 1. TYPICAL TARGET DOMAINS FOR TRAINING IN CRM (ADAPTED FROM ICAO, HUMAN FACTOR Digest 1989) ................................................................. 12

FIGURE 2. THE IMPACT ON SAFETY DUE TO EXPERIENCE EROSION (RSSB, 2003b) .................. 43

FIGURE 3. THE ROUTE MAP OF KCRC SHOWING STATIONS AND ROUTES OF EAST RAIL (BLUE) AND WEST RAIL (MAGENTA) SERVICES IN HONG KONG. COVERAGE OF MTRCL IS SHOWN AS THIN GREY LINES. ................................................................. 55

FIGURE 4. OVERVIEW OF ITF ACTIVITIES FOR TRAINING (KCRC, 2006b) ................................ 67

FIGURE 5. THE SIX TASK ANALYSIS AREAS FOCUSED BY KCRC CRM TRAINING TO IMPROVE EXISTENT SAFETY PROTOCOLS ................................................................. 73

FIGURE 6. SCHEMATIC DIAGRAM OF CAB DISPLAY UNIT (KCRC & ALCAEL SELTRAC, 2003) ............ 93

FIGURE 7. SCHEMATIC OPERATIONS CONTROL CENTRE (OCC) OVERVIEW SHOWING THE IMPORTANCE OF DESIGN AND LAYOUT OF IMPORTANT INFORMATION .................................. 95

FIGURE 8. COMPLEXITY OF SIGNALLING LAYOUT AT LADBROKE GROVE JUNCTION ......... 97

FIGURE 9. TYPICAL STATION PLATFORM WITH PLATFORM SCREEN DOOR (PSD) (ADAPTED FROM KCRC ANNUAL REPORT, 2004) ................................................................. 101

FIGURE 10. RESOURCES CATEGORIES AND ALLOCATION IN WEST RAIL CRM (KCRC, 2006b) ........ 112

FIGURE 11. CONTEXT OF CRM TRAINING IN KCRC. CRM TRAINING WILL INCORPORATE ALL ASPECTS SHOWN TO MAKE FULL USE OF EXISTING FACILITIES FOR SAFETY ORIENTED TRAINING .................................... 115

FIGURE 12. SCHEMATIC DIAGRAM OF CAB DISPLAY UNIT (KCRC & ALCAEL SELTRAC, 2003) ......... 119

FIGURE 13. MONTHLY FIGURES OF INCIDENT INCURRING MORE THAN 8 MINUTES DELAY .............. 138

FIGURE 14. PIE CHART SHOWING BREAKDOWN OF STAFF COMMENDATIONS (96 IN TOTAL) (KCRC, 2005e, 2006b) ......................................................... 141

FIGURE 15. NUMBER OF STAFF COMPLAINTS FROM 2004 AND 2005 PERIOD (KCRC 2005e, 2006b) .... 141

FIGURE 16. TRENDS IN STAFF COMPLAINTS IN 2005 (KCRC 2005e, 2006b) ......................... 142

FIGURE 17. WEST RAIL SERVICE ACHIEVEMENT FOR 2005 AND 2006 (DATA SOURCE: WEST RAIL ANNUAL PERFORMANCE REVIEW REPORTS 2005 AND 2006) ............. 144

FIGURE 18. WEST RAIL WEEKLY SERVICE IMPACTS (DATA SOURCE: FAILURE AND DELAY STATISTICS 2005 AND 2006) ................................................................. 145

FIGURE 19. TRAINING COURSE EVALUATION FORM ................................................................. 153

FIGURE 20. COURSE FEEDBACK ON COURSE DESIGN ................................................................. 155

FIGURE 21. COURSE FEEDBACK ON COURSE LEADER ................................................................. 156

FIGURE 22. COURSE FEEDBACK ON TRAINING METHOD ................................................................. 156

FIGURE 23. OVERALL COMMENT ................................................................. 156

FIGURE 24. COURSE FEEDBACK ON RECOMMENDATION ................................................................. 157

FIGURE 25. – COURSE FEEDBACK ON SUGGESTION FOR OTHER COURSES ................................ 157
List of Tables

**Table 1.** Classification of Errors by Kletz (Adapted from Kletz, 2002) .................................. 23

**Table 2.** Comparison of rail infrastructure and ridership statistics between ER and WR .... 61

**Table 3.** Basic Training and Competence Assessment for New Train Drivers ..................... 76

**Table 4.** Job descriptions of STC and TC units detailing demarcation of responsibilities.
(Data source: RSSB T542) ........................................................................................................... 80

**Table 5.** Cognitive Skill Pattern Classification of Train Drivers/Traffic Controllers .......... 82

**Table 6.** Breakdown of teamwork skill dimensions to related CRM domains. ................. 113

**Table 7.** Comparison between Conventional and CRM/LOT Training .................................. 116

**Table 8.** WR Rule Book and Key Sections ................................................................................. 120

**Table 9.** WR Contingency Manual Coverage ........................................................................... 121

**Table 10.** WR SOP’s Coverage Section Headings ...................................................................... 122

**Table 11.** Criteria for sorting participants into groups ............................................................. 124

**Table 12.** CRM/LOT Training Course Contents ......................................................................... 125

**Table 13.** Mean ITF scores between teams after CRM training .............................................. 136

**Table 14.** Attitude Survey Questions for Crew Resource Management Training ............ 146

**Table 15.** West Rail Service Pledge and Actual Performance (Data source: West Rail
Annual Performance Review Reports 2005/2006) ................................................................. 150

**Table 16.** Post CRM Course Evaluation Score .......................................................................... 154
Chapter 1. Introduction

Recent world headline disasters such as the September 11 attacks, 2005 London transport bombings, and 2003 Daegu Subway arson attacks sent a strong warning to all nations that mass-transit systems are highly susceptible to arson or terrorist attacks with catastrophic consequences. Whilst it may be impossible to ever eliminate all forms of threats, one thing remains clear— the effectiveness of crew response to emergency situations can make a key difference between a minor incident and a full blown catastrophe.

Any railway system in operation involves a number of interacting mechanical and engineering components under the control of human input. Human operators are responsible for assimilating information under varying temporal and environmental conditions; following conditional rules or their personal experience to make such inputs.

The safety and efficiency of the railway and the quality of responses to incidents are therefore inseparably linked with the alertness and capabilities of human operators. Despite its importance, the ergonomic and human factors of rail safety has only received attention in recent years where railway agronomists from RSSB Standard
Board (RSSB, 2000) shed some insight to understand and devise relevant human factor work methods and practices. The sustained attention in recent years meant that the government, media, railway industries and general public had also begun to research and focus on human factors when evaluating railway safety and relevant case studies. In this context, the finding of human error should initiate the investigation for error provoking conditions and not end the investigation.

The influence and awareness of such factors lead the decision by train operating companies (TOC) to specifically enforce human factor training. Such training is focused on incident response, equipping staff to respond correctly to unexpected incidents, improving their crowd control and evacuation skills in case of fire or terrorist attacks (Bird, 1974).

1.1 Background on CRM

The concept of human factor may be relatively new to railway management, but have already been extensively researched and reformed in the aviation industry (Morgan, Olson, Kyte, Roop, & Carlisle, 2006). The collective inputs and suggestions from many such studies resulted in a new approach to pilot training in hopes of reducing pilot error. It is now common to find crew resource management (CRM) and line oriented training
(LOT) programs on pilot mental studies (ICAO, 1998 Human Factor Training Manual) showing improved performance and stress adaptations.

As both railway and aviation industries share many similar characteristics and demands, it can be expected that adopting similar training strategies in the railway industry may help develop better training and safety programs for train drivers and traffic controllers. Such a program could improve the efficiency of crew response to any emergencies and reduce the consequences of human errors in the railway sector.

1.2 Outline and Scope

The work in this thesis outlines one such training plan for railway by adapting methods already employed in the aviation industry. The form and structure of the aviation training program, its suitability for the railway industry as well as the integration of such a program onto existing railway training programs will be analysed. The program was trialled at the Kowloon Canton Railway Corporation (KCRC) West Rail in Hong Kong to evaluate its effectiveness.