# NON-TECHNICAL SKILLS OF CABIN CREW TO ENHANCE SAFETY: PLANNING FOR EDUCATIONAL TRAINING OF AN INTERNATIONAL AIRLINE


**BY**

**THATRI KWANSANG**


**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT**
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# ทักษะรอบด้านของพนักงานต้อนรับบนเครื่องบินเพื่อเสริมความปลอดภัย: การวางแผนการอบรมสำหรับสายการบินนานาชาติ

โดย

ธาตรี ขวัญสังข์



ดุษฎีนิพนธ์ฉบับนี้เป็นส่วนหนึ่งของการศึกษาตาม
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วิทยาลัยครูสุริยเทพ

บัณฑิตวิทยาลัย มหาวิทยาลัยรังสิต
ปีการศึกษา 2562

Dissertation entitled

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by

THATRI KWANSANG

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Assoc.Prof. Sita Yiemkuntitavorn, Ph.D.
Examination Committee Chairperson

---

Asst.Prof.Peangchan Goenchanart, Ed.D.
Member

---

Donrutai Boonprasitt, Ed.D.
Member

---

Wallapa Chalermvongsavej, Ph.D.
Member

---

Pimurai Limpapath, Ph.D.
Member and Advisor

Approved by Graduate School

(Asst.Prof.Plt.Off. Vannee Sooksatra, D.Eng.)
Dean of Graduate School
February 14, 2020

ดุษฎีนิพนธ์เรื่อง

**ทักษะรอบด้านของพนักงานต้อนรับบนเครื่องบินเพื่อเสริมความปลอดภัย: การวางแผนการอบรมสำหรับสายการบินนานาชาติ**

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ธาตรี ขวัญสังข์

ได้รับการพิจารณาให้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตร

ปริญญาศึกษาศาสตรดุษฎีบัณฑิต สาขาวิชาการศึกษา

มหาวิทยาลัยรังสิต

ปีการศึกษา 2562

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| รศ.ดร.ศิตา เยี่ยมขันติถาวร<br>ประธานกรรมการสอบ | ผศ.ดร.เพียงจันทร์ โกญจนาท<br>กรรมการ |
| ---------- | ---------- |
| ดร.ดลฤทัย บุญประสิทธิ์<br>กรรมการ | ดร.วัลลภา เฉลิมวงศาเวช<br>กรรมการ |

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**ดร.พิมพ์อุไร ลิมปพัทธ์**

**กรรมการและอาจารย์ที่ปรึกษา**

บัณฑิตวิทยาลัยรับรองแล้ว

(ผศ.ร.ต.หญิง ดร.วรรณี ศุขสาตร)

คณบดีบัณฑิตวิทยาลัย

14 กุมภาพันธ์ 2563

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Thatri Kwansang
Researcher

# กิตติกรรมประกาศ

ดุษฎีนิพนธ์ฉบับนี้ สำเร็จลุล่วงได้ด้วยความกรุณาอย่างสูงจากท่าน ดร.พิมพ์อุไร ลิมปพัทธ์ เป็นอาจารย์ที่ปรึกษาดุษฎีนิพนธ์ ที่ได้กรุณาสละเวลาอันมีค่ายิ่งให้คำปรึกษา คำแนะนำ และช่วยเหลือในการแก้ไขข้อบกพร่องต่างๆ เพื่อให้ดุษฎีนิพนธ์ฉบับนี้มีความถูกต้องสมบูรณ์ และคำขอบคุณเป็นพิเศษแด่ ดร.วัลลภา เฉลิมวงศาเวช สำหรับคำปรึกษาและความช่วยเหลือทางด้านการวิเคราะห์ข้อมูลเชิงสถิติ

ขอส่งคำขอบคุณไปยังเพื่อนร่วมงานในฝ่ายนิรภัยที่ให้การสนับสนุนและช่วยเหลือแบกภาระงานในขณะที่ผู้วิจัยศึกษาและทำดุษฎีนิพนธ์

ท้ายสุดนี้ผู้วิจัยขออุทิศบุญกุศลคุณความดี แด่บิดา มารดา ครูบาอาจารย์ และผู้มีพระคุณทุกท่านที่ทำให้ผู้วิจัย มีความสำเร็จในวันนี้ และขอขอบคุณ ครอบครัวอันเป็นที่รัก ที่เป็นกำลังใจช่วยเหลือ สนับสนุนด้วยดีเสมอมา

ธาตรี ขวัญสังข์

ผู้วิจัย

5710576 : Thatri Kwansang

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## Abstract

The objectives of this study were to examine and identify the levels of Non-Technical Skills (NTS) of the cabin crew in an international airline as to plan for an educational training to enhance safety. Questionnaires were employed from 438 cabin crews of an international airline. Descriptive statistics was used to describe frequency, percentage, means, and standard deviation. Data obtained, then, tested by Pearson's correlation coefficient and multivariate analysis of variance: 2 way MANOVA.

The findings revealed that there were statistically significant differences on Position with four of the NTS variables at the level of $p < .05$: Error recognition and attitudes toward the coworkers ($p = .44$); planning and coordinating resources ($p = .41$); workload with sign of stress and fatigue ($p = .39$); and communication and collaboration ($p = .19$), while no statistically significant difference on teamwork and leadership.

The result from an analysis of MANOVA, hence, would be used, to prepare and plan for an educational training, from the most urgently trained to the least, respectively. Since in an airline safety, the least significant skills were viewed as the weakest and most immediately trained, while the rest of the skills, nevertheless, must be strengthened and maintained. Accordingly, the skills to be trained were put into particular order as follows: 1) ERAC; 2) PandCR; 3) WSSR; 4) CandC; and 5) TandL. This is to enhance safety for all the passengers undergoing any cabin service at any time and any flight.

(Total 108 pages)

Keywords: Non- Technical Skills, Enhance Safety, Cabin Crews, International Airline, Planning for Educational Training

Student's Signature …..... Dissertation Advisor's Signature .....

5710576 : ธาตรี ขวัญสังข์

ชื่อดุษฎีนิพนธ์ : ทักษะรอบด้านของพนักงานต้อนรับบนเครื่องบินเพื่อเสริมความปลอดภัย: การวางแผนการอบรมสำหรับสายการบินนานาชาติ

หลักสูตร : ศึกษาศาสตรดุษฎีบัณฑิต สาขาวิชาการศึกษา

อาจารย์ที่ปรึกษา : ดร.พิมพ์อุไร ลิมปพัทธ์

**บทคัดย่อ**

การวิจัยในครั้งนี้มีวัตถุประสงค์เพื่อศึกษาระดับของทักษะรอบด้านของพนักงานต้อนรับบนเครื่องบินในสายการบินนานาชาติ และเพื่อวางแผนการอบรมเสริมความปลอดภัย โดยกลุ่มตัวอย่าง คือ พนักงานต้อนรับบนเครื่องบินของสายการบินนานาชาติแห่งหนึ่งจำนวน 438 คน

ผลการวิจัยพบว่าปัจจัยส่วนบุคคลทางด้านตำแหน่งงานมีผลต่อทักษะรอบด้านอย่างมีนัยสำคัญทางสถิติ โดยเรียงลำดับจากมากไปน้อยดังนี้ 1) การหยั่งรู้ถึงความผิดพลาดและทัศนคติของเพื่อนร่วมงาน 2) การวางแผนและการประสานงานร่วมกัน 3) ภาระงานและสัญญาณของความเครียดและความเหนื่อยล้า และ 4) การสื่อสารและการให้ความร่วมมือในขณะที่การทำงานเป็นทีมและภาวะผู้นำไม่มีนัยสำคัญทางสถิติกับตำแหน่งงาน

ส่วนของการวางแผนการอบรมทักษะรอบด้านของพนักงานต้อนรับบนเครื่องบินสำหรับสายการบินนานาชาติเพื่อเสริมความปลอดภัยควรนำเสนอต่อผู้บริหารเพื่อให้เกิดการฝึกอบรมขึ้นจริงนั้น ใช้ผลทางสถิติวิเคราะห์ความแปรปรวนเชิงพหุแบบสองทางมาเป็นแนวทางและตัวกำหนดโดยที่จำเป็นต้องอบรมให้ครบทั้งห้าทักษะ และใช้การเรียงลำดับค่านัยสำคัญทางสถิติเป็นสำคัญโดยทักษะที่มีค่านัยสำคัญทางสถิติใกล้ .05 มากที่สุดนับเป็นทักษะที่อ่อนที่สุด เพื่อใช้ในการกำหนดทิศทางที่ชัดเจนในการแก้ปัญหาให้ตรงจุดผ่านการฝึกอบรมทักษะรอบด้านแก่พนักงานต้อนรับบนเครื่องบินในครั้งนี้ จึงเรียงลำดับของทักษะที่ควรฝึกอบรมก่อนหลังดังนี้: 1) การหยั่งรู้ถึงความผิดลาดและทัศนคติของเพื่อนร่วมงาน 2) การวางแผนและการประสานงานร่วมกัน 3) ภาระงานและสัญญาณของความเครียดและความเหนื่อยล้า 4) การสื่อสารและการให้ความร่วมมือ และ 5) การทำงานเป็นทีมและภาวะผู้นำ ทั้งนี้เพื่อให้บรรลุเป้าหมายในการเสริมสร้างทักษะรอบด้านอันจะส่งผลโดยตรงต่อพนักงานต้อนรับบนเครื่องบินในการปฏิบัติหน้าที่บริการผู้โดยสารให้มีประสิทธิภาพมากยิ่งขึ้นในทุกเที่ยวบินและทุกเวลา

(ดุษฎีนิพนธ์มีจำนวนทั้งสิ้น 108 หน้า)

คำสำคัญ: ทักษะรอบด้าน, เสริมความปลอดภัย, การวางแผนการอบรม, พนักงานต้อนรับบนเครื่องบิน, สายการบินนานาชาติ

ลายมือชื่อนักศึกษา ..... ลายมือชื่ออาจารย์ที่ปรึกษา .....

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# Chapter 1

# Introduction

## 1.1 Background and Significance of the Study

Safety is generally crucial to the occupations concerning with freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment, property, or environment (DOD, 2000; Ocampo & Klaus, 2016; Sojka, 2017). Especially, in aviation, it has been defined by the International Civil Aviation Organization (ICAO) as "the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management (ICAO, 2013).

Particularly, in airline business, safety has been identified as a reflection of the actions, attitudes, and behavior of its members involving safety issues (American Chemical Society [ACS], 2013; Matos, Simpson, & Simmons, 2017) which emphasizes the improvement of protocols and procedures in terms of regulatory compliance enhancement (Mc Garry et al., 2013) which must be incorporated with every level of the lines of duty. Because of this, it is necessary for the organization to educate its airline employees of how to understand and perform as safe as they can. While education is the key of learning facilitation, or the acquisition of knowledge, habits, beliefs, values, and skills, it involves the methods of teaching, and training (Dewey, 1944). As Dewey (1944) further explained, through continuous process of learning and acquiring knowledge and information of safety culture, skills and novel creations in several aspects of safety will help motivate the learners to perceive themselves as part of the societal contributions of the safety culture.

In their daily routines, the cabin crews, in particular, must face with various risky conditions that involved error and uncertainty that may occur anytime, anyplace, and with anybody (Reason, 1997). As can be seen in the evidence that mostly 80 percent of the accidents and incidents were caused by human factors rather than the technical ones (Helmreich, 2000; ICAO, 2013; Reason, 1990; Groenweg & Wagenaar, 1987). This is also evident in Cabin Crew Safety Training Manual (ICAO, 2014) that the cabin safety is a contribution of accidents and incident prevention, as well as the protection of the aircraft's occupants by the proactive management of safety which is indicated by rules and regulations concerning the operational environment, documentation and procedures, manufacturing and design, furnishing and equipment on board, qualification and training of cabin crew, and human performance. The purpose of cabin safety is to reduce hazards in cabin and surrounding environment which effect to the reduction of accident. Regarding, IATA safety report (2015) (IATA, 2016) cabin safety's concept was applied in various tasks, such as hot food and beverages service, security, handling of unruly passengers, turbulence, medical emergencies, contagious diseases, cabin baggage and enforcement of safety regulations. ICAO (2013), thus, enhanced safety training toward a competency-based approach to cabin crew.

With the above reasons, safety education training for the cabin crews in order to improve safety according to rules, regulations, and safety in hazardous circumstances through safety training (Corner, Markowitz, & Pidgeon, 2014) as to increase attitudes, behaviors, and performance of all the collaborators involved appears necessary (Burke et al., 2006; Gessel, Rall, & Staender, 2011; Meyer, 2017). Accordingly, with a systematic safety training, it is expected a mediation of change in the safety attitudes and performance of crew members (Cheyne, Cox, Oliver, & Tomas, 1998; Glendon & Stanton, 2000; Reiman & Oedewald, 2002; Williamson, Feyer, Cairns, & Biancotti, 1997; Zohar, 1980) which could turned to be a reward rather than a punishment by the organization and society at large (Artuso et al., 2005). It is believed that, safety training that implement reduction of accidents, illnesses, and injuries will improve a sustainable and long term development for the design of future training that could lead to the effective training cycle. (Davis, n.d.)

In aviation, Non-technical skills (NTS)-- Communication and Collaboration, Teamwork and Leadership, Workload with Sign of Stress and Fatigue, Planning and Coordinating Resources, and Error Recognition and Attitudes towards the Coworker, (Flin & Maran, 2015), which contribute to safe and efficient task performance are regularly performed. Recently, NTS has been benefited among the crew members in terms of uncertainty problems. Moreover, ICAO has considered in a part of human factor and performance training as one of significant issue to enhance cabin crew safety skills and behaviors (Bonsall & Taylor, 2011; CAA, 2006; Flin & Maran, 2015; Flin, O'Corner, & Crichton, 2008; ICAO, 2014; Rutherford, Flin, & Mitchell, 2012).

Because of the above reasons, those cabin crews certainly required to be well-trained in safety training programs as to ensure that they will be able to handle uncertainty situations that may occur during the operation as to prevent high risk the same way as the training for pilots' safety-Joint Aviation Authorities (Kanki, Helmreich, & Anca, 2010). However, this kind of training has not been, specifically and sufficiently, applied to cabin crew. Nevertheless, none of courses and trainings have been designed and developed to train cabin crew as for the significance of cabin safety by using NTS. Realizing, the existing of cabin incidents/accidents that could be prevented, this study, thus, was conducted to examine and identify the levels of NTS of the cabin crews to as to plan for education training enhance safety of an international airline.

## 1.2 Research Questions

1.2.1 What are the levels of NTS of the cabin crews to enhance safety in an international airline?

1.2.2 What are the plans and directions that need to be prepared in NTS educational training to enhance safety of the cabin crews in an international airline?

## 1.3 Research Objectives

The objectives of this study were to examine and identify the levels of the NTS of the cabin crews in an international airline applying to plan for an educational training to enhance safety.

## 1.4 The scope of study

1.4.1 This study explained:

Non-technical skills (NTS)--Communication and Collaboration, Teamwork and Leadership, Workload with Sign of Stress and Fatigue, Planning and Coordinating Resources, and Error Recognition and Attitudes towards the Coworker, of the cabin crews in an international airline to enhance safety and application of the levels the levels of the NTS of the cabin crews in an international airline applying to plan for an educational training to enhance safety.

1.4.2 Population and Sampling

1) Population

The population was selected from Cabin crews of International Airline of an international airline. From 1123 cabin crews of Don Mueang (DMK) Base, Chiang Mai (CNX) Base, and Phuket (HKT) Base.

2) Sampling

Convenient sampling was employed. The sampling size of the study was calculated and determined through Kanchanawasri, Pittayanon, & Srisukho (2016), with the confidence level at 99 percent with the population size of 1123, margin error at ± 5 percent, and the ideal sample size of 474 was gained. The questionnaires, however, were obtained at 438.

1.4.3 Measures

A survey research design was employed in this study. The items in the questionnaire was developed and adapted from Cockpit Management Attitude Questionnaire (CMAQ) by Gregorich and Wilhelm (1993); Ship management Attitudes Questionnaire (SMAQ) by Röttger, Vetter, and Kowalski, 2012); and Safety Attitudes Questionnaire (SAQ) by Sexton et al. (2007). A five-point Likert scale (Likert, 1967), ranking from Strong Disagree (1) to Strongly Agree (5) as to measure the levels of NTS of the cabin crews.

1.4.4 Data Analysis

Descriptive Statistic was used to describe means, standard deviation, skewness, and kurtosis. The levels of agreement and attitudes analyzed and explained according the Best and Kahn (2006) from Strongly Agree to Strongly Disagree which translated into the level of attitudes as Strongly Positive Attitudes (SPA) to Strongly Negative Attitudes (SNA).

Cronbach's Alpha Coefficient ($\alpha$) was run for the test of reliability of the questionnaire items, with a value of .925. Coefficient correlation and multivariate analysis of variance: 2 Way MANOVA were also performed.

## 1.5 Technical Terms

**Non-technical skills:** the mental, social, and personal-management abilities that complement the technical skills of workers and contribute to safe and effective performance in complex work systems. They include competencies such as decision-making, workload management, team communication, situation awareness, and stress management.

**Cabin crew member:** A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

**Skills:** A combination of skills, knowledge, and attitudes required to perform a task to the prescribed standard.

**Education:** Education is defined as the process that performed to facilitate learning or enhance knowledge, skills, values, beliefs and habits. The methodology of education such as discussion, teaching, training, and directed research, it generally takes place under the guidance of educators, but learners may also educate themselves (Dewey, 1944).

**ICAO**: The International Civil Aviation Organization (ICAO; French: Organisation de l'aviation civile internationale) is a specialized agency of the United Nations. It changes the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. Its headquarters is located in the Quartier International of Montreal, Quebec, Canada.

**International Airline:** An operator that, for remuneration, provides scheduled or non-scheduled air transport services to the public for the carriage of passengers, freight or mail. This category also includes small-scale operators, such as air taxis and commercial business operators, that provide commercial air transport services through international countries.

**Safety:** Safety has been defined in various ways regarding a functional of circumstances, such as medical industry, food and nutrition, engineering, logistic and etc. (Nicolas, Couttenier, Rohner, & Thoenig, 2017; Pan & Hildre, 2017; Thung et al., 2017; Vilbrandt et al., 2017). More specific, Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment" (DOD, 2000; Ocampo & Klaus, 2016; Sojka, 2017)

**Training:** The process of bringing a person to an agreed standard of proficiency by practice and instruction.

# Chapter 2

# Literature Review

## 2.1 Safety

Safety has been defined in different ways depending on their functional of circumstances (Berman et al., 2017; Pan & Hildre, 2017; Thung et al., 2017; Vilbrandt et al., 2017). While in the Oxford Online Dictionary (2017) has defined safety as a condition of being protected from or unlikely to cause danger, risk, or injury, researchers in the fields of safety defined it as the freedom from any conditions of death, injury, occupational illness, damage to or loss of equipment, property, and environment which (DOD, 2000; Ocampo & Klaus, 2016; Sojka, 2017) helps avoid danger or harm of unexpected, unintended injury, or events as well as accident (Loimer & Guarnieri, 1996; Silva, 2017).

When it comes to aviation, National transportation Safety Board has viewed safety as the state in which the possibility of harm to persons or of property damage that can be handled and reduced to a minimum or at the acceptable level according to a continuous process of hazard identification and risk management (ICAO, 2013)

## 2.2 Safety Culture

Safety culture has been defined as emergent, envisage of a complex system which involves with cultural conflict and competing sets of interests among organization (Silbey, 2009) anlog with the issues of organizational management, levels of structure, systems, policies, and the top to low level of positions (Blazsin & Guldenmund, 2015; Gergen, 2001). It is viewed that the more the workers of the organization are trained to be positive in terms of the attitudes, behaviors, and performance the more success in safety culture the organization will become. (Chouldhry et al., 2007; Edwards et al.,

2013; Guldenmund, 2000; Haukelid, 2008; Hsieh, 2010; Levering, 2016; Warrick, 2017; Xie et al., 2017; Nyarugwe et al., 2016; Pant & Alberti, 1997; Warszawska & Kraslawski, 2016).

## 2.3 Human Factors and Non-technical skills relevant to safety

In the last decade, human factor has been enhanced as critical in safety and risk management (Cacciabue, 2000, 2004). While human error can cause harm that exceeds some limit of acceptability or out of tolerance of action which indicated by the performance defined by the system (Kirwan, 1994). In 1988, Earl Wiener and David Nagel's Human Factors in Aviation were first announced as importance in the areas of cockpit organization, crew interaction, crew fitness and judgment, and automation. After that, in March 1988, there was a clash of a Flight 410 after the departure from a Colombian airport which caused death to all the passengers and crews. Because of this, it was called for the importance of controlled flight into terrain as the cause of accident in aviation (Aviation Safety Network, n.d.). Further research showed that the lack of teamwork and cockpit distractions were the cause of this non-flying personnel presented in the cockpit (Salas & Maurino, 2010).

Since then, both in Europe and the US, there has been an emphasis of Non-technical skills which involve the cognitive and social skills -- interpersonal communication, leadership, and decision-making available to pilots including other crew-members, procedures, the machine interface, and themselves of experienced professionals that help decrease the numerous errors caused by human beings while later has been adopted in a number of other high-reliability industries including aviation maintenance, healthcare, air traffic control, the fire service, offshore oil/gas and the maritime industry (Moriarty, 2015; Roberson, Shaharyar, & Aneni, 2014).

## 2.4 Trainings in NTS has been applied in several domains, several examples include:

Pilots' non-technical skills (NOTECHS) in aviation;

Bridge Resource Management (BRM) in the marine industry;

Non-Technical Skills for Surgeons (NOTSS);

Anesthetists' Non-Technical Skills (ANTS);

Trauma Non-Technical Skills (T-NOTECHS);

Well Operations Crew Resource Management (WOCRM) in offshore well control.

The key factors of Non-Technical Skills include:

Communication;

Decision Making;

Leadership/Supervision;

Teamwork;

Situation Awareness; and

Stress and fatigue.

Social skills, Cognitive Skills, and Managerial Skills.

It is desirable for aviation business that all cabin crew members possess the skills listed in the table below.

Table 2.1 Cabin Crew Skills and Behavioural Indicators

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| Communication | Demonstrates effective verbal, non-verbal and written communications, in normal, abnormal, and emergency situations. | Desired behaviors:<br>• Conveys information clearly, accurately and concisely using standard operator phraseology. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | • Communicates with the appropriate crew member(s) using the operator's designated common language (multilingual flight/ cabin crew) including pertinent information including What, When, Where and How.<br>• Is aware of, and correctly interprets, the non-verbal elements inherent in communication.<br>• Actively listens, seeks clarification and asks relevant questions.<br>• Transmits information in a timely manner. |
| | | Undesired behaviors:<br>• Communicates using incomplete, untimely or unclear messages.<br>• Inhibits the communication process. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| Teamwork and leadership | Demonstrates effective teamwork and leadership. | Desired behaviors:<br>• Maintains open communication and encourages team participation.<br>• Works quickly to constructively resolve conflict and disagreements.<br>• Follows and provides instructions when necessary.<br>• Gives/receives constructive feedback. |
| | | Undesired behaviors:<br>• Ignores other crew members' input or concerns.<br>• Does not follow instructions.<br>• Does not take part in team consultation or decisions. |
| Workload management | Workload Management: Manages available resources efficiently to prioritize and perform tasks effectively. | Desired behaviors:<br>• Plans, prioritizes and monitors tasks appropriately through the |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | utilization of all available resources.• Manages, recovers and redistributes tasks from interruptions, distractions, variations and failures effectively.<br>• Offers and accepts assistance, delegates when necessary, recognizes own limitation and asks for help as appropriate.<br>Undesired behaviors:<br>• Demonstrates poor or no planning.<br>• Does not monitor tasks.<br>• Does not recognize and utilize all available resources.<br>• Lacks willingness or refuses to contribute. |
| Time management | Time Management: Accomplishes tasks in timely manner or in allocated time under all circumstances. | Desired behaviors:<br>• Is aware of phase of flight and tasks that need to be completed |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | .• Shows no delay in assuming responsibility or completing tasks as necessary.<br>• Manages time efficiently when carrying out task in coordination with other crew members. |
| | | Undesired behaviors:<br>• Does not react rapidly or delays response affecting other crew members.<br>• Does not complete tasks in allocated time.<br>• Demonstrates inefficient application of operator procedures. |
| Managerial Skills (In-charge cabin crew member) | | |
| Flexibility | Demonstrates the ability to adjust thinking or adapt in response to changing goals and/or environment. | Desired behaviors:<br>• Demonstrates ability to anticipate change and adapt.<br>• Resets tasks as situations dictate.<br>• Manages unforeseen circumstances to achieve safest outcome by improvising solutions. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | • Encourages feedback. |
| | | Undesired behaviors:<br>• Is unable to adjust/modify from course of action.<br>• Demonstrates complacent behavior by taking procedures for granted.<br>• Is resistant to new ideas and change. |
| Delegation | Entrusts a task or responsibility to another person. | Desired behaviors:<br>• Demonstrates capability to recognize strengths and weaknesses - chooses right person for the task.<br>• Engages others in planning and allocates activities fairly and appropriately according to abilities.<br>• Sets clear objectives with specific expectations.<br>Undesired behaviors:<br>• Has an unrealistic expectation for tasks.<br>• Provides unclear task assignment. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | • Creates unnecessary duplication; assigns the same task to multiple cabin crew members.<br>• Demonstrates failure to delegate. |
| Empathy | Demonstrates the ability to understand and share feelings of another. | Desired behaviors:<br>• Demonstrates ability to listen actively.<br>• Shows respect, tolerance, and understanding for others.<br>• Recognizes emotions of crew members and conveys compassion.<br>• Encourages and supports crew members.<br>Undesired behaviors:<br>• Demonstrates intolerance to cultural differences.<br>• Is unable to recognize and deal with emotions.<br>• Expresses uncaring, detached and/or indifferent attitude. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| Planning and coordinating resources | Unifies, integrates and synchronizes the efforts of crew members so as to provide unity of action in the pursuit of common goals. This is achieved through planning, organizing, staffing, directing and controlling. | Desired behaviors:<br>• Plans, prioritizes and schedules tasks effectively.<br>• Manages time and workload efficiently.<br>• Uses resources in an effective manner.<br>• Assesses situations, identifies obstacles and redeploys resources as necessary.<br>Undesired behaviors:<br>• Fails to recognize and use all resources available.<br>• Fails to have a clear plan.<br>• Sets inappropriate objectives. |
| Cognitive Skills | | |
| Situational Awareness | Perceives and comprehends all of the relevant information available and anticipates what could happen that may affect the operation. | Desired behaviors:<br>• Demonstrates self-awareness and the capacity to perform and recognizes limitations.<br>• Identifies and assesses the aircraft, affected persons and environment accurately. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | • Recognizes and effectively responds to indications of reduced situational awareness or potential threats and develops effective contingency plans.<br>Undesired behaviors:<br>• Does not recognize potential reductions to situation awareness.<br>• Does not possess a clear understanding of situation.<br>• Is not alert or engaged.<br>• Is not able to plan accordingly.<br>• Reacts inappropriately to distractions. |
| Error recognition and management | Detects errors and traps them before they produce negative consequences. | Desired behaviors:<br>• Adheres to operator procedures.<br>• Observes and identifies that an error exists.<br>• Responds to, reports and effectively manages an error. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | • Mitigates and manages any further errors/consequences.<br>• Follow-ups/self-evaluates.<br>Undesired behaviors:<br>• Disregards operator procedures.<br>• Fails to recognize an error.<br>• Observes errors and does not address them.<br>• Does not manage the situation.<br>• Does not acknowledge his/her errors. |
| Decision making | Accurately identifies risks and utilizes appropriate decision-ak1ing process. | Desired behaviors:<br>• Perceives and accurately identifies situation including validating the information.<br>• Employs appropriate decision-making process.<br>• Applies the appropriate problem-solving strategies and procedures. |

Table 2.1 Cabin Crew Skills and Behavioural Indicators (Cont.)

| Social Skills | | |
|---|---|---|
| Skills | Skill Descriptions | Behavior Indicators |
| | | Undesired behaviors:<br>• Does not make a decision.<br>• Is fixated.<br>• Makes incorrect decision(s).<br>• Demonstrates lack of proficiency.<br>• Acts based on judgments or assumptions without complete information. |

Source: Adapted and Taken from ICAO, 2014

## 2.5 Communication and Collaboration (CandC)

While communication is a major part of good teamwork (Nieva, Fleishman, & Riecl, 1978) it is salient for workplace efficiency and safety. Since communication is the exchange of information, feedback or response, ideas, and feeling of a person in that it helps increase knowledge and strengthen the relationships, and also establishes predictable behavior patterns, among others, as to maintain the task performance (Kanki & Palmer, 1993). Four components of communication are What (the information), How (the mediums), Why (the reason), and Who (the person/s).

Communication refers to either the qualities or styles of interaction coordinated by issuing instructions, stating intentions, and sending and receiving information (Wiener, kanki, & Helmreich, 1993) or a key activity in co-ordination between humans which plays a vital role in ensuring the successful completion of tasks (Driskell & Salas, 1991; Rasmussen, Brehmer, & Leplat, 1991).

TYPES OF BARRIER EXAMPLES

Table 2.2 Safety-related communication barriers

| TYPES OF BARRIER | EXAMPLES |
|---|---|
| Sender's errors | |
| Omitting communication | Clipping call signs. Inadequate detail in aircraft logbook, that is, describing a component as simply INOP. |
| Passing on incomplete/ ambiguous information | A pilot not adequately defining an abnormal situation to ATC. |
| Passing on incorrect information | Call-sign confusion. Providing the wrong part number. |
| Making assumptions | Assuming the receiver has prior knowledge of an incident. |
| Sender's/receiver's errors | |
| Failing to reach a clear and mutual understanding | Confusion about assigned runway Confusion over which team member is performing a given task. |
| Failing to follow recognized sequence for communication | Using non-standard phraseology or jargon. |
| Poor elocution/failing to communicate clearly | Rushing or mumbled speech Illegible writing in aircraft logbook. |
| Failing to read back messages | Failure of a pilot to read back mandatory pieces of information to ATC requiring further communication to resolve. |

Table 2.2 Safety-related communication barriers (Cont.)

| TYPES OF BARRIER | EXAMPLES |
|---|---|
| Receiver's errors | |
| Not responding correctly to communication | An aggressive response |
| Mis-recording information communication | Writing down an incorrect QNH. Incorrectly or inadequately labelling maintenance work conducted in an aircraft logbook. |
| Not listening partial or total message | Tuning out due to high workload. |
| External barriers | |
| Environmental noise | Engine noise. A loud nearby conversation among co-workers. |
| Visual obstructions | Describing an aircraft component at night. Referring to an aircraft or component across the hangar or tarmac. |
| Co-worker interference | A co-worker interrupting the conversation. |

Source: Adapted from CASA's , 2012a, p.86

## 2.6 Workload with Sign of Stress and Fatigue (WSSF)

Stress refers as the nonspecific reaction of an organism to any environmental demand (Quick, J.C., & Quick, J.D., 1984). There are many types of stress that a person can experience. Although they have common results on the person, it is convenient to classify them according to their sources because the goal is, ultimately, to reduce unnecessary stress both in the workplace and in one's personal life. The four broad categories are, therefore, physical stressors, social stressors, and speed and load stress, and disregulation due to irregular work schedules (Selye, 1976).

### 2.6.1 Working Memory

Cognitive workload and fatigue are interrelated with work environments (Ackerman 2011; Hancock 2013; Hancock & Desmond 2001; Matthews, Desmond,

Neubauer, & Hancock, 2012) short-term memory, representational components, and an executive attentional component (Kane & Engle 2002) . As workload increases, performance decreases and fatigue boots up. In other words, the more time we spent on the task, the more fatigue we get and the performance goes downward.

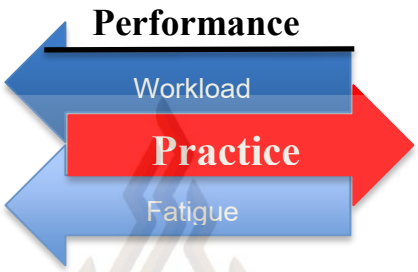


Figure 2.1 Bi-directional influences of workload and time on performance
Source: Guastello et al., 2014, p. 306

Thus, working memory or channel capacity is the main boundary in bounded rationality that Baddeley (Baddeley, Gathercole, & Spooner, 2003) identified as phonological loop and the visuospatial sketchpad which is likely to be an emergent result of the working memory components that are required by a particular task (Logie, 2011; Wickens, 2002) going through different perceptual, cognitive, or motor resources.

### 2.6.2 Effects of stress

1) The effect on performance

It has been noted in a fight or flight theory that a large amount of stress response can increase our performance under dangerous scenarios while a small amount of stress response can, on the contrary, improve our functioning in regular activities. Nevertheless, our bodies can handle only so much stress and after a certain tipping point performance will start to decline (Yerkes & Dodson, 1908). The nature of the task is the key that affects the task performance.

In aviation, cognitive workload is highly related to the task environment in that; workload for air traffic controllers is closely tied to the number of aircraft trying to take off or land according to weather conditions within a given time frame (Loft,

Sanderson, Neal, & Mooij, 2007) Physiological measures capture signs of workload (Schmorrow & Stanney 2008), and a comparison of different physiological metrics (Matthews et al., 2015) are used as the indicators of overworkload and fatigue. Measurements such as the galvanic skin response (GSR), heart rate or breathing rate which reflect the effects of workload centered on performance levels or of error rates (Funke, 2012) or the behavioral outcomes (Guastello, Shircel, Malon, Timm, 2015; Hancock, 1996; Oron-Gilad, Szalma, Stafford, & Hancock, 2008; Yeh & Wickens, 1988).

2) Fatigue

Fatigue is considered to be a complexity of multifactorial and overlapping constructs of muscular and mental fatigue (Dawson, Noy, Härmä, Åkerstedt, & Belenky, 2011) which consists of both peripheral changes of the muscle (due to metabolic changes) and central nervous system failing to drive the motoneurons adequately (Gandevia, 2001; Chmura & Nazar, 2010). When it comes to mental fatigue, it involves directly with a psychobiological state that caused by prolonged periods of demanding cognitive activity which is defined by subjective feelings such as tiredness and/or lack of energy (Boksem & Tops, 2008; Fukuda et al., 1994; Guastello, Boeh, Shumaker, & Schimmels, 2012; Guastello et al., 2012; Hong, 2010).

Two types of fatigue are drawn between acute and chronic fatigues. While acute fatigue is regarded as a consequence of mental or bodily labor, emotional stress, insufficient recovery or temporary illness, it is viewed as a normal regulatory response to different conditions of healthy/ normal people which normally disappeared by rest of sufficient duration and quality, sleep, diet and exercise (Techera, Hallowell, Stambaugh, & Littlejohn, 2016). Chronic fatigue, on the other hand, is usually long-term severe or chronic illness and treatments (Techera et al., 2016) lasting for more than 6 months and cause profound disabling.

## 2.7 Planning and Coordinating Resources (PandCR)

Planning is the process of determining the organization's goals and objectives and making the provisions for their achievement. It involves choosing a course of action from available alternatives. Marshall (1992) has suggested that generally there are four

major types of planning exercises. While strategic planning involves determining organizational goals and how to achieve them, this usually occurs at the top management level. Tactical planning is concerned with implementing the strategic plans and involves middle and lower management. Contingency planning anticipates possible problems or changes that may occur in the future and prepares to deal with them effectively as they arise. It helps in managing and combining resources to fulfill the overall objectives of the extension organization.

### 2.7.1 Strategic Planning VS Long-Term Planning

Flemming (1989) explains that while strategic planning deals with the basic objectives of an organization and allocating resources to their accomplishment, long-term planning builds on current goals and practices and proposes modifications for the future. In doing strategic planning changes or anticipated changes in the environment that suggest more radical moves away from current practices are expected. The elements of strategic plans, thus, include: Organization mission statement – What; Strategic analysis – Why; Strategic formulation – Where; Long-term objectives implementation – When; and How Operational plans - When and How.

Chambers (1993) provides a framework for longer-term commitment to development in that in each organization and sub units, coworkers are being encouraged to put work teams in place to make sure that each work together as a team in a cohesive and focused business unit. Each work team is asked to develop an effective process for discussion of major challenges and opportunities facing the organization, so that the strategic plans can be developed. Accordingly, the updated plans can be implemented at all levels of management.

Those work-team objectives include:

1) Involving all levels of staff in consultation;

2) Designing and implementing a process to develop-goals and objectives for the organization and unit; a strategic process for the next five to ten years;

3) Defining and clarifying organizational structures and identifying functions, customers, and service delivery models;

4) Identifying changes and staged approaches needed to move from the current situation to what will be required over the next three to five years;

5) Identifying and recommending priorities for policy and program development;

6) Incorporating goals for expenditure reduction, service quality improvement, workforce management, accountability, technology, and business process improvement; and

7) Stating the start date and first report date

Coordination is defined as:

1) a cooperation among two or more independent organizations or competitors which share their own knowledge and resources of (Kaynak & Tuğer, 2014)

2) a management reinforced by parallel efforts as to enhance cooperation among workers (Moshtari & Gonçalves, 2012); and

3) a common measure performed by two or more organizations in order to solve the problems and issues. Indeed, the coordination among two or more organizations is a process of designing and implementing programs and policies to achieve common goals (Aghajani, Amin, & Abasgholipour, 2014).

No matter what type of coordination used in each organization: vertical -- reporting directly to supervisor(s) and staff (Salari, Heidari, Julaee, Shafaght, & Rahimi, 2011) and horizontal – reporting directly to management team and colleagues (Brandon, 2011), it is expected that the more coordination in an organization the more: 1) economic efficiency; 2) organizational learning; 3) accessing to new skills; 4) service qualities; 5) risk diffusion; 6) improving the public accountability; and 7) reducing the uncertainty and avoiding the conflict (Moshtari & Gonçalves, 2012) will be gained.

## 2.8 Teamwork and Leadership (TandL)

In today's global economy, every organization faces with complex and dynamic environments that attributed to competitiveness (Scott & Tiessen, 1990). Effective teamwork, thus, is necessary. While team is viewed as an essential feature of modern management (Tennant & Langford, 2006), teamwork is defined as a collection of skillful individuals who get together as a team perform their task as to achieve their common goals (Greenberg & Baron, 2003; Harris, P., & Harris, K., 1996; Hoegel & Gemuende, 2001; Scarnati, 2001).

Several research highlights on the essential elements of a team as it is focused on both a common goal and a clear purpose (Fisher, Hunter, & Macrosson, 1997; Johnson, D., & Johnson, R., 1995, 1999; Harris, P., & Harris, K., 1996; Parker, 1990). While a team is viewed as an integral part of an organization which incorporated as a part of the delivery of tertiary units, successful teamwork relies on the synergy of all the team members in order to promote and nurture positive and effective work environment. Team members, thus, must be flexible to adapt to cooperative working environments where goals are achieved through collaboration and social interdependence rather than individualised, competitive goals (Luca & Tarricone, 2001).

Three aspects of teamwork are crucial -- 1) interactions among individuals; 2) group effort; and 3) interdependence. Good teamwork, hence, resulted in individuals working jointly in a supportive environment as to achieve common goals through knowledge and skills. Building on this conceptualization, it is encouraged that successful teamwork relies on the synergy between team members in creating an environment, where all members contribute and participate in order to develop an effective team outcome (Luca & Tarricone, 2002). The more flexible among the coworkers the more cooperative work settings can be achieved.

Teamwork can increase in productivity and high degree of adaptability in operational management (Vašková, 2007). Also, the positive interaction and collaboration among employees allow them to have a better understanding of the

significance of teamwork in building up the organizational civilization (Wageman, 1997). As such organization civilization could be divided into taskwork and teamwork processes (Rousseau, AubeÂ, & Savoie., 2006). While taskwork is about what should be done, teamwork is described as a process of how things should be done (Marks, Mathieu, & Zaccaro, 2001). Specifically, as taskwork is concerned with an execution of core technical competencies within a given domain, teamwork refers to the range of interactive and interdependent behavioral processes among team members that convert team inputs (Rousseau et al., 2006).

Good teamwork is considered to be positively related to team effectiveness such as team performance, group cohesion, collective efficacy, and member satisfaction (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). However, while teamwork is consisted of multiple observable and measurable behaviors (Marks et al., 2001), two highly cited frameworks focused on behaviors that regulate a team's performance and keep the team together are the most famous. These two components coincide with locomotion and maintenance (Lewin, 1935). These two behaviors help team members determine whether their actions have moved them closer towards accomplishing their team goals and objectives, and whether any modifications are required in order to facilitate future success.

When it comes to leadership and team effectiveness, transactional leadership and transformational leadership come into picture (Burns, 1978). As Bucic, (Bucic, Robinson, & Ramburuth, 2010). coined that leadership style (transformational and transactional or ambidextrous) help increase a clear vision, an understanding of an organizational culture, a focus on performance development and an encourage in innovation (Gomez, 2017). A transformational style can also help create well-defined roles and responsibilities of team members which is very crucial for the success of a team (Mickan & Rodger, 2000). Exercising excellent tactical skills could improve workers' performance (Eden, 1990; Jacobs & Singell; 1993; George & Bettenhausen, 1990).

## 2.9 Error recognition and Attitudes towards the Coworker (ERAC)

### 2.9.1 Safe systems for error management

In the past, especially in transportation service, error management (RAIB, 2017) has focused on a systems approach to incident prevention, via, for example, ergonomics, user centered design, safe systems of work, defined processes and procedures and assuring the technical competence of personnel. The example of typical system level tools to support error management are Prospective error analysis:

1) Error prevention tools (e.g. pre & post task briefing, self & peer checking, task observation and coaching, communication Techniques);

2) Competence management and assurance;

3) Creating a fair and just safety culture;

4) Root cause analysis and lessons learnt processes Procedures assessment and design;

5) Equipment and workspace assessment and design; and

6) Fatigue and workload management.

The above system level tools showed that the system approach can help ensure safety throughout different stages of the product lifecycle (from design and development through to installation, use and maintenance) where it is critical that a system level approach be taken.

### 2.9.2 Psycho-social sources of error

While there are many system level influences on human performance, there are also many influences at the individual level. These include social, psychological and cultural factors, as follows (Health and Safety Executive Annual Report and Accounts 2016/17, 2017)

1) Social – the way in which other people and the social context influence people's behavior, such as:

1.1) Peer pressure-changing one's values, attitudes and behaviors to align with those encouraged by peers;

1.2) Group/social norms-following the rules/behaviors considered acceptable and expected within a given group or social setting.

2) Psychological – the way in which heuristics (mental shortcuts) and cognitive biases, be they conscious or unconscious, influence our judgement and subsequent behavior, there are some example affected Heuristic/cognitive bias such as (HSE, 2016/17, 2017)

2.1) Familiarity (impact to Failure to take account of all available information and judgments are based on incorrect assumptions (poor decision making); and

2.2) Group-thinking (Desire for harmony or conformity among a group of people) impact to Irrational or dysfunctional decision making.

It is explained that those cognitive biases prevent people from perform well in what can be a complex and in-formation rich environment. If trained well, a highly practiced procedure can be carried out quickly and reliably. Focusing on a single issue can allow people to avoid information overload. However, they can also lead to inadvertent errors. While human error cannot be eliminated, prevention can be made to minimize, catch and mitigate errors by ensuring that people have appropriate non-technical skills to cope with the risks and demands of their work.

## 2.10 Situation awareness

Situation awareness is essentially a continuous monitoring of the task with an ability in noticing what is going on and detecting any changes in the environment (Flin & Maran, 2015). One's ability to accurately perceive what is in the cockpit and outside the aircraft (ICAO, 2014); or simply as knowing what is going on; or more precisely as, the perception of the elements in the environment within a volume of time and space,

the comprehension of their meaning, and the projection of their status in the near future (Endsley, 1995).

Situation awareness (Shrestha, Prince, Baker, & Salas, 1995) is viewed as a dynamic, multifaceted construct that involves the maintenance and anticipation of critical task performance events. It is crucial that individuals monitor the environment so that potential problems can be corrected before they escalate.situation by collecting information from all the sources that are available to them (Flin et al., 2003).

Elements of Situation Awareness in aviation are classified as follows (Flin et al., 2015):

1) Awareness of aircraft systems: active knowledge of mode and state of systems, aircraft energy states (e.g. fuel);

2) Awareness of external environment: active knowledge of current and future position, weather, air traffic, terrain; and

3) Awareness of time: sense of available time and thinking ahead to consider future conditions and contingencies;

## 2.11 Decision making

Flin et al. (2015) noted that decision-making usually involves more than one method, depending on circumstances. The main types of decision-making are recognition primed (a pattern of cognition/intuitive process), rule based, analytical (comparing optional courses of action) and creative. Those factors depend on time pressure, task demands, feasibility of options and the level of constraint. In aeronautical (Kaempf & Klein, 1995) or pilot judgement, while pilots' decision making, involve with different types of decisions at different times, Orasanu (1993), a NASA contended that styles of decision making used by pilots in different situations are crucial, especially, in terms of safety and prevention of disaster.

Elements of decision making (Jensen,1996; Flin et al., 2003, 2015; Stokes, Kemper, & Kite, 1997) are classified as follows:

1) Problem definition and diagnosis: gathering information and determining the nature of the situation. Considering alternative explanations for observed conditions;

2) Option generation: formulating alternative approaches to dealing with the situation. The opportunity for this will depend on available time and information; and

3) Risk assessment and option selection: making a judgment or evaluation of the level of risk/ hazard in the alternative approaches and choosing a preferred approach;

4) Outcome review: considering the effectiveness/suitability of the selected option against the current plan, once the course of action has been implemented.

## 2.12 Review Research and Related Articles.

### 2.12.1 on-Technical Training

1) Safety Training

Because accidents still are occurring, safety trainings, thus, are necessary and should be prepared and planned as to prevent devastated situations caused , especially, by human's error.

2) Safety as a Dimension of Professional Development

Safety is a feature of everyday working practices, from normal to crisis situations. It is important to separate safety know-how from professional know-how (safety skills from professional skills). Since safety is one result, among others, of doing things right. Accordingly, the section below would illustrate the importance of NTS in safety as integrated into all aspect of professionalism as to prevent people from all kinds of harm.

3) The 'Good Professional'

A good professional would be better equipped to make the most appropriate choices in any situation. Training, definitely, has been viewed as one of the good professional approach as to enhance effectiveness in career concerning safety.

Mostly, safety training courses are focused on rules, procedures, fueled by experts' knowledge and standards and taught in a way that is disconnected from the professional gestures. Training in safety, however, is about promoting the development of good professionals at large. Technical training courses that include safety aspects and focus primarily on improving the performance of practices are the most effective ones for anchoring good behavior in professional practice (Kamaté, Laroche, & Daniellou, 2018)

For individuals and teams to perform effectively in high-risk environments, they must be proficient in the non-technical skills. However, implementation of the non-technical skills need to be introduced and enhanced in a well-prepared and -planed training.

### 2.12.2 Crew Resource Management and Non-technical Skills Training

One of the most obvious demonstrations of this approach of trying to build safety skills into general professional competence is Crew Resource Management (CRM). This is a training approach introduced by the aviation industry in the 1980s with an idea that only a focus on technical skills was not sufficient, the non-technical skills, yet, needed to be emphasized as well. Accident analyses, for instance, which enormously, benefitted from cockpit voice recorders, illustrated that lack of teamwork, leadership, decision making, situation awareness and communication were contributing to devastated incidents and situations (Kanki et al., 2010). This was not to say that organizational factors, such as managerial behaviors, company culture, and work conditions were salient (Maurino, Reason, Johnston, & Lee, 1995) but all the non-technical skills trainings will help prepare and prevent workers and people involved from their lost (Goldstein & Ford, 2002; Truelove, 1997).

### 2.12.3 Method for designing and delivering effective training:

Phase 1: Training objectives: the content of a non-technical skills training course is dependent on the identified training needs, and the ability to design methods to address these training needs in an effective manner. For each non-technical skill, training objectives should be written. These objectives should be recorded in such a way

that they can be empirically evaluated to determine whether or not they were accomplished. The training objectives then guide the development of the content of the course. Training objectives are crucial as these can be empirically evaluated to assess whether or not they were achieved through the training (Goldstein & Ford, 2002).

Phase 2: Training and development: select and design training program. The methods of training are the tools and techniques used to deliver the training to the team. Salas and Cannon-Bowers (Salas, Cannon-Bowers, & Blickensderfer, 1997) distinguish between three different types of training delivery methods: information-based, demonstration-based and practice-based:

1) Information-based: Information-based techniques are passive lecture-type training for conveying information, which can be complemented with reading material and web-based information. While this kind of method can be used with a large group of trainees with an introduction of unfamiliar concepts and topics, it might include large amount of information being processed;

2) Demonstration-based: Demonstration-based methods allow the participants to observe the required behaviors, actions or strategies. Video clips is common in this type of training. For example, the films of pilots' decision-making in emergencies with re-enactments based on cockpit voice recordings or recreating the technical setting of engineers for the last minutes prior to an accident from the black box recording, the position of the flight controls, and the voice recording provide a detailed view of a flight crew's activities prior to the crash. These types of recordings, in particular, are greatly used in the US Navy CRM program. Those video clips, usually, allow the trainees to participate in error prevention activities. The trainees can observe and rate non-technical skills demonstrated by the actors in those videos as well. By using the demonstration-based methods, it will help the audience engaging with the provided situational examples to which the audience can relate; and

3) Practice-based: Up to the present, practice-based methods are argued to be the most effective of non-technical skills training. To make it the most optimal, however, it is necessary to be facilitated by activities such as cueing, feedback, or

coaching to help the participants to understand, organise and assimilate the learning objectives (Dismukes & Smith, 2000; Salas et al., 1997).

Examples of practice-based methods are small syndicate exercises and role play which have simulators that can be used to model both normal and emergency work situations, or they can simulate using existing facilities on the worksite in that non-technical skills, e.g. decision-making or team co-ordination can be modelled and based upon real incidents or on accident reports (Rall & Gaba, 2005).

Design training strategy: The training methods combine with training objectives in order to shape the development of specific training strategies should be theoretically based and use sound instructional principles (Paris, Salas, & Cannon-Bowers, 1999). For instance, in study, non-technical skill for enhancing safety for the cabin crews was the case.

Phase 3: Training evaluation: It is vital that a training course is evaluated to determine whether objectives have been achieved. According to The FAA (2004), each CRM training program must be systematically assessed by its organization as to determine whether it has achieved its goals. As such the assessment should be able to measure what it has been claimed to be measured. This would be critical, particularly, for improvement of the recurrent trainings. It is also recommended that training evaluation should be multifaceted and considers several separate methods of assessment.

Design assessment measures: The evaluation methods can be categorized into different levels of training effects – ranging from individual to organizational indicators. Kirkpatrick (1976; 1998) provided measurement of reaction and learning. For example, while the reaction involves the quality of the trainer's performance, or the suitability of the facilities, the learning refers to principles, facts, and skills which were understood and absorbed by the participants' At the learning level, the attitude change and knowledge can also be assessed by using a paper-based attitude questionnaire that should, at the minimum, be based on an established instrument such as the Cockpit Management Attitudes Questionnaire (CMAQ; Gregorich & Wilhelm, 1993). The CMAQ is a well-established training, evaluation and research tool developed to assess the effects of CRM training for flight crew as well.

## 2.13 Related Research

### 2.13.1 Collective Behavior and Team Performance

In modern complex systems, it is salient that collective behavior of the team member influences not only team but also team interaction in that the more collectively oriented the members perform, the more effective team performance will become. As Driskell and Salas (1991) indicated that collectively oriented team members were more likely to attend to the task inputs as to improve their performance during team interaction other than were egocentric team members.

### 2.13.2 Modeling distributed decision making.

In decision making, different aspects of distributed decision making are separately modeled into: 1) work space; 2) individual actors who are in charge of particular work space; and 3) social organization of the agents necessary for coordination of their activities which based on a system control point of view. In this view, decision making is considered as a continuous control task.

This includes:

1) Cognitive engineering approach -- work domain, control and decision tasks, cognitive control and resources, work coordination and social organization control;

2) System-theoretic approach -- levels of decision complexity;

3) Layers -- levels of an organizational hierarchy;

4) Relationships between different notions -- coordination strategies/ organization and the management science approach [closed-system models, open-system models, Thompson's approach, relationships with control theory and cognitive science, self-designing organizations] (Rasmussen et al., 1991)

2.13.3 Aviation non-technical skills guidebook

It has been recognized by the Defense Aviation NTS Foundation and Continuation training courses (Cooper, White, & Lauber, 1980) that high performance not only depends on technical knowledge and skills but also on human factors such as their abilities and limitations of how tasks can be achieved and maintained of high performance and standards. While 'non-technical skills (NTS) has been reviews to encompass:

1) The ability to recognized and manage human performance limitations;
2) To make sound decisions
3) To communicate effectively;
4) To perform effectively as a team;
5) To manage stress and fatigue; and
6) To maintain situation awareness. This guidebook has been designed to support

2.13.4 The Sleep, Subjective Fatigue, and Sustained Attention of Commercial Airline Pilots during an International Pattern

Pertrilli, Roach, Dawson, and Lamond (2006) noted that, in aviation, international commercial airline pilots usually experienced heightened fatigue due to irregular sleep schedules, long duty days, night flying, and multiple time zone changes. Mostly, commercial airline flight and duty time regulations are based on work/rest factors rather than sleep/wake factors. Thus, pilots' amount of sleep, subjective fatigue, and sustained attention before and after international flights should be studied. It was found that it should be taken into consideration that sleep and fatigue countermeasures during international patterns was salient in that the risk of fatigue can be minimized as the sleep obtained by pilots should be taken into account in the development of flight and duty time regulations.

2.13.5 A temporally based framework and taxonomy of team processes.

Marks et al. (2001) has reviewed that much of the work in organizations could be completed through teamwork -- people working together to achieve something beyond the capabilities of individuals working alone. Also, success could be developed by training its organizations' members as to be the better and effective workers counting not only on their talents but also accessible resources. organizations retool its resource systems developed

2.13.6 A method for measuring threats and errors in surgery

Studied measuring threats and errors in surgery, Catchpole et al. (2008) argued that there were relationships between technical skills, non-technical skills, intraoperative performance, and outcomes and duration and safety of the procedure. Modifications will be required as to provide reliability, variation in team composition, and procedures. It is believed that by developing non-technical skills for the members involved, better performance and safety could be improved, especially, through direct training of all the non-technical skills required in performing the surgery.

2.13.7 Improving the organization and management of extension

As every organization has constantly encountered forces that drive them to change. Since change brings something new and unknown, resistance is naturally occurred. Vincent and Jeffrey (2011) had suggested that while the managers need to get cooperation from subordinates, peers, superiors, and all the parties involved no matter what level of management, size of the organizational unit, function of the unit, lateral interdependence, crisis conditions, and stage in the organizational life cycle. In order to accomplish their tasks of changing, it was initiated that the managers should have the ability in:

1) building and maintaining relationships;
2) getting and giving information;

3) influencing people; and

4) decision making.

2.13.8 In search of vigilance: The problem of iatrogenically created psychological phenomena.

Throughout human history we encounter a continuing story of conflict. The following statements therefore summarize the present argument of how to view conflict:

1) Human beings generally have problems of detecting failure during long periods of enforced watch;

2) Detection technologies under the driving pressures of worldwide conflict have been encouraged in the middle of the previous century; and

3) Encouraged to pursue observation on phenomena found in historic precedent.

From these observations, conflict can be seen to reside as much in the way people encounter, organize, and convey work to the people that do it as it does in any intrinsic human failing While, some find it extremely damaging, others may be barely disturbed (Hancock, 2013)

2.13.9 How Unexpected Events Produce an Escalation of Cognitive and Coordinative Demands

Communication and collaboration among team members are crucial. It is claimed that the greater the trouble in the underlying process of workload or the higher the tempo of operations, the greater the information processing activities required to cope with the trouble or pace of activities. it demands for knowledge, monitoring, attentional control, information, and communication among team members all tend to increase with the unusualness, tempo, and criticality of situations. Workload should be in right proportions as for the workers or practitioner can least afford new tasks, new memory demands, or tension of the job at hand (Hancock & Desmond, 2001).

2.13.10 The handbook of operator fatigue

Fatigue is a recognized problem in many facets of the human enterprise. It is not confined to any one area of activity but enters all situations in which humans have to perform for extended intervals of time. Most problematic are the circumstances in which obligatory action is continuous and the results of failure are evidently serious or even catastrophic. Since there have been legislative efforts made at state, federal and international levels as to regulate appropriate working hours of employees of all types, an implementation of such legislation is indeed needed to be restored (Matthews et al., 2012).

2.13.11 Mental fatigue: Costs and benefits

A framework for mental fatigue is proposed in that it has involved with an integrated evaluation of both expected rewards and energetical costs concerning continued performance. In risk performance, it was argued that evaluation of predicted rewards and energetical costs is central to the phenomenon of mental fatigue in that people will no longer be motivated to engage in task performance when energetical costs are perceived to outweigh predicted rewards (Boksem & Tops, 2008)

2.13.12 Safety at the Sharp End: A Guide to Non-Technical Skills

While organizational safety culture is a key determinant of workplace safety, non-technical skills is considered important. These skills -- cognitive and social skills-- required for efficient and safe operations, are termed as Crew Resource Management (CRM) skills. In civil aviation, it has long been recognized that if better non-technical skills are presented and demonstrated by the personnel operating and maintaining the system, the risk prevention could be increased. As a result, CRM training, thus, has been proposed by aviation. Accordingly, it covers the areas of identification, training, and evaluation of non-technical skills and has been written for use by individuals who are studying or training these skills of CRM and other safety or human factors courses as well (Flin et al., 2008)

2.13.13 The next generation of macroergonomics: Integrating safety climate

Harmonized work system is contended to improve numerous aspects of organizational performance and effectiveness, and this is accomplished by incorporating the foundational theoretical framework of sociotechnical systems theory (STS) -- 1) the personnel subsystem, the ways individuals perform tasks, the technological subsystem, and the tasks to be performed. It is claimed that management is an important aspect of the personnel subsystem regarding supervisors' influence over employee safety in that management commitment to safety and communication pertaining to safety are valued as a true priority from both top management and direct supervisors (Roberson et al., 2014)

2.13.14 Practical Human Factors for Pilots

Human factors are at the heart of aviation safety. In aviation, Crew Resource Management (CRM) which is how pilots are normally exposed to human factors training of Non-technical skills are assessed during simulator checks and line checks. Human performance which encompasses skill based, rule based or knowledge based is required to prevent error -- the failure of planned actions to achieve their desired goal. Those includes unsafe acts, all types of error, and violations where individual intentionally does not follow a procedure or acts contrary to a procedure.

Accordingly, Threat and Error Management 2 (TEM2) has been proposed to prevent unsafe acts that may lead to undesired aircraft states (UASs) that can lead to negative outcomes if not managed appropriately. It is assumed that threats can be managed and avoided as UAS management requires immediate recovery actions as to avoid a negative outcome. TEM2 can be used to minimize the risk of unstable approaches occurring.

No matter how human error has been viewed -- 1) systems are safe and that when things go wrong, it is the fault of the humans involved; 2) systems are not inherently safe, particularly if they are complex, and that humans usually try to do their

best; and 3) make things go right in a system rather than focusing entirely on trying to eliminate the things that go wrong. Hence, enhancing a company's safety culture can help to achieve safety, especially, by instituting a just culture and making changes to transition from Safety I to Safety II (Moriarty, 2015)

# Chapter 3

# Research Methodology

## 3.1 Research Plan

After the research topic had been approved from the committee members of the Oral defense, questionnaire was developed and presented to the adviser for verifying content validity in order to amend and develop the list more efficiently;

Submitted the questionnaire to verify the accuracy and appropriation of the questionnaire by Index of item objective congruence: IOC to 5 experts which include scholars in the field of Education and professionals in Aviation in the line of Safety Enhancement as to verify its validity: The scales for the verification of the questionnaire items are:

Scoring +1 = Certain that the test is congruent with the objectives or content.
Scoring 0 = Uncertain that the test is congruent with the objectives or content.
Scoring -1 = Certain that the test is NOT congruent with the objectives or content;

Pretested the questionnaire with 33 of the non-sample cabin crews as to analyze their reliability by Alpha coefficient of Cronbach (1990: 202-204);

Requested for the letter of permission from Faculty of Education to ask for the permission from Chief Executive Officer of an international airline to collect data from the cabin crews; Collected data; and

Checked and verified the entire questionnaire that received from the samples to select the most completed papers for further analysis.

## 3.2 Research Conclusion

3.2.1 Instrument Design

A design of survey research was combined by items of Cockpit Management Attitude Questionnaire (CMAQ) by Gregorich and Wilhelm (1993); Ship management Attitudes Questionnaire (SMAQ) by Röttger et al. (2012); and Safety Attitudes Questionnaire (SAQ) by Sexton, et al. (2006). A five-point Likert scale (Likert, 1967), ranking from Strong Disagree (1) to Strongly Agree (5) to measure the levels of NTS of cabin crews was applied as fundamental of questionnaire in this survey research.

3.2.2 Instrument creation and validity

Questionnaires to understand non-technical skills of cabin crews in International Airlines was created by a review of related journals, studies, theories, and literatures. A content validity was confirmed by 5 experts to ensure that the questionnaire is collaborated to the objective of research.
After Submitted the questionnaire to verify the reliability and appropriation of the questionnaire by Index of item objective congruence: IOC to 5 experts and revise follow IOC advise. The result is 0.80

Pretest of the questionnaire with 33 of the non-sample cabin crews as to analyze their reliability by Alpha coefficient of Cronbach was at 0.925.

3.2.3 Questionnaires consisting of personal information such as gender, education, position, and working experiences were provided to the cabin crews of an International Airline which based at:

1) Don Mueang Headquarter (DMK)
2) Chiang Mai Hub (CNX)
3) Phuket Hub (HKT)

The questionnaires items, were to examine and identify the background of Non-technical skills of cabin crew in international airlines for training preparation towards five Non-Technical Skills, included:

1) Communication and Collaboration (CandC, items 1, 2, 3, 4, 5, 6, 7, and 8);

2) Teamwork and Leadership (TandL, Items 9, 10, 11, 12, 13, 14, and 15);

3) Workload with Sign of Stress and Fatigue (WSSF, Items 16, 17, 18, 19, 20, 21, 22, and 23);

4) Planning and Coordinating Resources (PandCR, Items 24, 25, 26, 27, 28, and 29); and

5) Error recognition and Attitudes towards the Coworker (ERAC, Items 30, 31, 32, and 33);

3.2.4 Planning for training for Non-technical skills of cabin crews

## 3.3 Population and Sampling.

3.3.1 Population

Cabin crews of International Airline who work in an International Airline was 1123 at Don Mueang (DMK), Chiang Mai (CNX), and Phuket (HKT).

3.3.2 Sample size

Convenient sampling was employed. The sampling size of the study was calculated through Kanchanawasri et al. (2016) to calculate and determine the sample size. The result of confidence level was calculated at 99 percent, population size was 1123, with the margin error at ± 5 percent, and ideal sample size at 474. However, at the end, the questionnaires were obtained at 438.

3.3.3 Sample methods.

The Participants were randomly selected by stratified random sampling through separating population in a small group and select sampling from each group. The researcher points to see perception of cabin crews in each HUB, such as Don Mueang (DMK) Chiang Mai (CNX) and Phuket (HKT).

## 3.4 Measures

Questionnaire was employed to collect data composing of Non-Technical Skills of Cabin Crew by using theories, concepts, and non-technical skills/behaviors indicators in a plan for educational training of an airline to enhance safety.

The questionnaire comprised two parts:

Part I: Personal and demographic information of the respondents comprised of genders, ages, years of work, education background, working sections, position and rank of the flight or class which cabin crews operating or attending.

Part II: Non-technical skills which contained 33 items. It was categorized into 5 groups as the following:

1) Communication and Collaboration (CandC) items 1-8;
2) Teamwork and Leadership (TandL) items 9-15;
3) Workload with Sign of Stress and Fatigue (WSSF) items 16-23;
4) Planning and Coordinating Resources (PandCR) items 24-29; and
5) Error recognition and Attitudes towards the Coworker (ERAC) items 30-33

In terms of the scales, the questionnaire items were rated with 5 scales of standard measurement by Likert scale (Likert, 1967) ranking from Strong Disagree (1) to Strongly Agree (5).

## 3.5 Data Analysis

The statistic is illustrated to describe as mean means, standard deviation, skewness, and kurtosis. Level of agreement and attitude were analyzed and determined by the study of Best and Kahn (2006).

The Level of Attitudes were:

The Mean scores of 4.5-5.00 = Strongly Positive Attitude (SPA)

The Mean scores of 3.50-4.49 = Positive Attitude (PA)

The Mean scores of 2.5-3.49 = Moderately Positive Attitude (MPA)

The Mean scores of 1.50-2.49 = Negative Attitude (NA)

The Mean scores of 1.00-1.49 = Strongly Negative Attitude (SNA)

The Level of Agreement

The Mean scores of 4.5-5.00 = Strongly Agree

The Mean scores of 3.50-4.49 = Agree

The Mean scores of 2.5-3.49 = Neutrally Agree

The Mean scores of 1.50-2.49 = Disagree

The Mean scores of 1.00-1.49 = Strongly Disagree

Analyses of reliability by Alpha coefficient of Cronbach (with a value of .925), Coefficient Correlation, and Multivariate analysis of variance: 2 Way MANOVA were performed.

# Chapter 4

## Results of Data Analysis

The research of Non-technical Skills of cabin crew to enhance safety: planning for education training of an International Airline is objected to examine and identify the levels of the NTS of the cabin crews in an international airline applying to plan for an educational training to enhance safety. The analyses of this research were concluded and analyzed according to:

4.1 Non-technical Skills of the cabin crews of an International Airline;

4.2 Correlation of Non-technical Skills of the cabin crews of an International Airline;

4.3 Background information of the cabin crews of an International Airline: gender, education, position, and experiences; and

4.4 Plan of the training as to enhance safety in Non-technical skills function for the cabin crews.

Abbreviation and symbols

| | | |
|---|---|---|
| $\bar{x}$ | = | Arithmetic Mean |
| S.D. | = | Standard Deviation |
| SK | = | Skewness |
| KU | = | Kurtosis |
| r | = | Pearson Product Moment Correlation Coefficient |
| ρ | = | Statistical Significance |
| df | = | Degree of Freedom |
| n | = | Sample size |
| $R^2$ | = | Chi-square |
| SPA | = | Strongly Positive Attitude |
| PA | = | Positive Attitude |
| MPA | = | Moderately Positive Attitude |

| | | |
|---|---|---|
| NA | = | Negative Attitude |
| SNA | = | Strongly Negative Attitude |
| CandC | = | Communication and Collaboration |
| TandL | = | Teamwork and Leadership |
| WSSF | = | Workload with Sign of Stress and Fatigue |
| PandCR | = | Planning and Coordinating Resources |
| ERAC | = | Error recognition and Attitudes towards the Coworker |

## 4.1 The analysis of general information and Non-technical Skills of cabin crew

4.1.1 Part 1: Demographic of Respondents

The sampling of 438 cabin crews of an International Airline was described in table 4 in that a majority of the respondents was female which about two/third of total (68.5%) and male was (31.5%). In terms of educational background, almost all of the respondents held a Bachelor Degree while 6.2% were in graduate levels. According to the positions, while the number of cabin crews was 77.4%), the senior cabin crews were at 22.6%. According to working experience, more than a half of the cabin crews, which was at 59.8% had been working from 1 to 5 years, 30.1% from 6 to 10 years, and the rest which was more than 10 years was at 10 %.

Table 4.1 Frequency and Percentage of Respondents

(n=438)

| Frequency and percentage of respondents | | | |
|---|---|---|---|
| Demographics of respondents | | Frequency | Percentage |
| Gender | 1. Male | 138 | 31.5 |
| | 2. Female | 300 | 68.5 |

Table 4.1 Frequency and Percentage of Respondents (Cont.)

(n=438)

| Frequency and percentage of respondents | | |
|---|---|---|
| Demographics of respondents | Frequency | Percentage |
| Education | | |
| 1.Bachelor Degree | 411 | 93.8 |
| 2.Above the Bachelor Degree | 27 | 6.2 |
| Position | | |
| 1. Cabin Crew | 339 | 77.4 |
| 2. Senior Cabin Crew | 99 | 22.6 |
| Working Experiences<br>Duration of work | | |
| 1. 1-5 Years | 262 | 59.8 |
| 2. 6-10 Years | 132 | 30.1 |
| 3. More Than 10 Years | 44 | 10.0 |

4.1.2 Part 2: An analysis of Non-Technical Skills of cabin crew to enhance safety.

Part 2 dealt with five components of the Non-Technical Skills of the cabin crews in an International Airline: 1) CandC (Communication and Collaboration) -- Q1-8; 2) TandL (Teamwork and Leadership) -- Q9-15; 3) WSSF (Workload with Sign of Stress and Fatigue) -- Q16-23; 4) PandCR (Planning and Coordinating Resources) -- Q24-29; and 5). ERAC (Error recognition and Attitudes towards the Coworker) -- Q30-33.

Table 4.2 illustrated that the measurement on communication and collaboration skills of the cabin crews were averaged on ($\bar{x}$ = 4.52, S.D. = 0.580) was shown to be strongly positive attitudes on the respondents. While the mean scores of 8

items varied from 4.19 to 4.87 and standard deviation from 0.375 to 0.685, which indicated positive attitudes to strongly positive attitudes on the respondents.

Particularly, the mean scores were over 4.00 on all of the 8 items of communication and collaboration, from the most to the least, respectively. Those items read: "Good commuication is important," ($\bar{x}$ = 4.87, S.D. = 0.375); "Crew coordination is important," ($\bar{x}$ = 4.86, S.D. = 0.386);

"I experience good collaboration with senior cabin crews,"; "To resolve conflicts, team members should openly discuss their differences with each other." ($\bar{x}$ = 4.5, S.D. = 0.709); "I feel comfortable going to the senior cabin crew to discuss problems or operation issues," ($\bar{x}$ = 4.36, S.D. = 0.643); "I experience good collaboration among cabin crews," ($\bar{x}$ = 4.37, S.D. = 0.646); and "I experience good collaboration with senior cabin crews." ($\bar{x}$ = 4.37, S.D. = 0.593).

Table 4.2 Mean and Standard Deviation of CandC

N=438

| | CandC | $\bar{x}$ | S.D. | Level of |
|---|---|---|---|---|
| Q1 | Good communication is important. | 4.87 | 0.375 | SPA |
| Q2 | Crew coordination is important. | 4.86 | 0.386 | SPA |
| Q3 | I feel comfortable going to the senior cabin crew to discuss problems or operation issues. | 4.36 | 0.643 | PA |
| Q4 | I experience good collaboration with cockpit crews. | 4.19 | 0.685 | PA |
| Q5 | I experience good collaboration with senior cabin crews. | 4.37 | 0.593 | PA |
| Q6 | I experience good collaboration among cabin crews. | 4.37 | 0.646 | PA |
| Q7 | To resolve conflicts, team members should openly discuss their differences with each other. | 4.5 | 0.709 | SPA |
| Q8 | The pre-flight briefing is important for safety and for effective team management. | 4.66 | 0.603 | SPA |
| Total | | 4.52 | 0.580 | SPA |

Table 4.3 illustrated the component of TandL (Team Work and Leadership) with means at ($\bar{x}$ = 4.53) and standard deviation at (S.D. = 0.592). The majority of the respondents strongly positive on good crew members of the chain of command ($\bar{x}$ = 4.53, S.D. = 0.592) followed by A procedure in senior cabin crew ($\bar{x}$ = 4.38, S.D. = 0.584). A team support was at the third level of ($\bar{x}$ = 4.22, S.D. = 0.62) followed by relying on superiors to tell what to do in critical situation ($\bar{x}$ = 4.16, S.D. = 0.777) while the least three factors of the component read: "Problems among personnel are constructively managed by our superiors," ($\bar{x}$ = 3.95, S.D. = 0.823); "As a crew member I should be aware that disagreeing with others could reduce crew effectiveness," ($\bar{x}$ = 3.92, S.D. = 0.864); and "I can work well even with less capable team members at last ($\bar{x}$ = 3.90, S.D. = 0.81).

Regarding the levels of agreement and attitude, there was only one strongly positive attitude (SPA) on Q9 while the less were at positive attitude (PA).

Table 4.3 Mean and Standard Deviation of TandL

N=438

| | TandL | $\bar{x}$ | S.D. | Level of |
|---|---|---|---|---|
| Q9 | Good crew member should follow chain of command. | 4.53 | 0.592 | SPA |
| Q10 | In critical situations, I rely on my superiors to tell me what to do. | 4.16 | 0.777 | PA |
| Q11 | I still can work well even with less capable team member. | 3.90 | 0.81 | PA |
| Q12 | Senior cabin crew should be effective in procedure. | 4.38 | 0.584 | PA |
| Q13 | My team usually support my detail efforts. | 4.22 | 0.624 | PA |
| Q14 | Problems among personnel are constructively managed by our superiors. | 3.95 | 0.823 | PA |
| Q15 | As a crew member I should be aware that disagreeing with others could reduce crew effectiveness. | 3.92 | 0.864 | PA |
| Total | | 4.15 | 0.725 | PA |

Table 4.4, A table of WSSF (Workload and Sign of Stress and Fatigue) showed that overall mean was at about four ($\bar{x}$ = 4.17) and standard deviation (S.D.) was at 0.746.

The respondents showed their strongly positive measurement only on awareness of their own psychological stress or physical problems before or during flight as the most important ($\bar{x}$ = 4.51, S.D. = 0.604), while the less were at positively agreed. Those included: An unexpected situation during flight should be recognized ($\bar{x}$ = 4.43, S.D. = 0.692); stress and fatigue of other member's and discussion about the problem ($\bar{x}$ = 4.39, S.D. = 0.631); being alert of their over-workload ($\bar{x}$ = 4.37, S.D. = 0.646); the personal problems of other team members ($\bar{x}$ = 4.29, S.D = 0.746); a personal problem toward insufficient to their performance ($\bar{x}$ = 3.73, S.D.=0.999); and stress and fatigue that may affect their effectiveness ($\bar{x}$ = 3.76, S.D. = 0.967).

Table 4.4 Mean and Standard Deviation of WSSF
N=438

| | WSSF | $\bar{x}$ | S.D. | Level of |
|---|---|---|---|---|
| Q16 | Even when fatigued, I could perform effectively during critical phase maneuvers. | 3.86 | 0.854 | PA |
| Q17 | Cabin Crews should be aware of their own psychological stress or physical problems before or during the flight. | 4.51 | 0.604 | SPA |
| Q18 | I always aware of unexpected situation during the flight. | 4.43 | 0.692 | PA |
| Q19 | Each cabin crew should recognize for the signs of stress and fatigue of other crew members then discuss the situation with each other. | 4.39 | 0.631 | PA |
| Q20 | We should be aware of, and sensitive to, the personal problems of other team members. | 4.29 | 0.746 | PA |
| Q21 | I am less effective when stressed or fatigued. | 3.76 | 0.967 | PA |
| Q22 | Personal problems can insufficiently affect my performance. | 3.73 | 0.999 | PA |
| Q23 | Cabin crew members should be alert of their actual or potential over-workloads. | 4.37 | 0.646 | PA |
| Total | | 4.17 | 0.767 | PA |

Table 4.5, Regarding PandCR (Perception in Planning and Coordinating Resources) with the overall mean and standard deviation of ($\bar{x}$ 4.41, S.D. = 0.653) with good in clear planning and procedure of senior cabin crews was selected as the most strongly agreed ($\bar{x}$ = 4.6, S.D. = 0.544) and a successful of cabin management was primarily a function of the senior cabin crew's proficiency least agreed ($\bar{x}$ = 4.24, S.D. = 0.707). An encouragement of member to question about the procedures during normal flight operations and emergencies by senior cabin crews ($\bar{x}$ = 4.42, S.D. = 0.610) and also chosen at the positively agreed as well as team members share responsibilities for prioritizing activities in high workload situations ($\bar{x}$ = 4.5, S.D. = 0.615). Furthermore, an encouragement of senior cabin crew to question about procedure during emergency ($\bar{x}$ = 4.36, S.D. = 0.740) and taking control in emergency and nonstandard situations were at highly agreed level ($\bar{x}$ = 4.32, S.D. = 0.707).

Regarding Q24 and Q29, they were at the level of strongly agreed (SPA), and the rest were at positively agreed (PA)

Table 4.5 Mean and Standard Deviation of PandCR
N=438

| | PandCR | $\bar{x}$ | S.D. | Level of |
|---|---|---|---|---|
| Q24 | The senior cabin crew should be clear in plans and procedures. | 4.6 | 0.544 | SPA |
| Q25 | The senior cabin crew should encourage crew members to question about the procedures during normal flight operations and emergencies. | 4.42 | 0.610 | PA |
| Q26 | The senior cabin crew should encourage crew members to question about the procedures during emergencies. | 4.36 | 0.740 | PA |
| Q27 | The senior cabin crew should take control in emergency and nonstandard situations. | 4.32 | 0.707 | PA |
| Q28 | Overall, successful cabin management is primarily a function of the senior cabin crew's proficiency. | 4.24 | 0.707 | PA |
| Q29 | Team members share responsibilities for prioritizing activities in high workload situations. | 4.5 | 0.615 | SPA |
| Total | | 4.41 | 0.653 | PA |

Table 4.6, In terms of ERAC (Error recognition and Attitudes towards the Coworker), the overall mean was demonstrated at ($\bar{x}$ = 4.06) and standard deviation (S.D. = 0.85). The majority of the respondents positively agreed on all mistake should be handled appropriately ($\bar{x}$ = 4.39, S.D. = 0.677). A debriefing and critique of procedures and decisions after each flight is important for developing and maintaining effective crew coordination were at the second level ($\bar{x}$ = 4.04, S.D. = 0.898), followed by error is a sign of incompetence ($\bar{x}$ = 3.92, S.D. = 0.836) which was at the same level of importance of avoiding negative comments about the procedures and techniques of other crew members ($\bar{x}$ = 3.89, S.D. = 0.991). In this table, all items were at positively agreed (PA).

Table 4.6 Mean and Standard Deviation of ERAC
N=438

| | ERAC | $\bar{x}$ | S.D. | | | Level of |
|---|---|---|---|---|---|---|
| Q30 | A debriefing and critique of procedures and decisions after each flight is important for developing and maintaining effective crew coordination. | 4.04 | 0.898 | -1.191 | 2.316 | PA |
| Q31 | Error are a sign of incompetence. | 3.92 | 0.836 | -0.774 | 1.236 | PA |
| Q32 | All the mistakes should be handled appropriately. | 4.39 | 0.677 | -1.731 | 7.924 | PA |
| Q33 | It is important to avoid negative comments about the procedures and techniques of other crew members. | 3.89 | 0.991 | -0.737 | 0.031 | PA |
| Total | | 4.06 | 0.85 | -1.11 | 2.88 | PA |

In order to verify the levels of correlations, the correlations coefficient scale was between -1 to 1 by Hinkle (1998) as followed:

| r | Level of correlation |
|---|---|
| .90-1.00 | Very high level of correlation |

| | |
|---|---|
| .70-.90 | High level of correlation |
| .50-.70 | Moderate level of correlation |
| .30-.50 | Low level of correlation |
| .00-.30 | Very low level of correlation |

Regarding table 4.7, there were 10 pairs of correlation coefficient of Pearson among 5 components. All 10 pairs were correlated positively between 0.311-0.632 at the statistical significance of 0.01.

Paires of coefficient correlation could be classified as below.

1) CandC (Communication and Collaboration) was moderately correlated with TandL (Teamwork and Leadership) r = .513 with a statistical significance of .01;

2) WSSF (Workload with Sign Stress and Fatigue) correlated with CandC (Communication and Collaboration) r = .467 with a statistical significance of .01;

3) PandCR (Planning and Coordinating Resources)

CandC (Communication and Collaboration) r = .453 with statistical significance of .01;

4) CandC (Communication and Collaboration) and ERAC (Error recognition and Attitudes towards the Coworker) r = .311 with a statistical significance of .01;

5) TandL (Teamwork and Leadership) correlated with Workload with Sign Stress and Fatigue (WSSF) r = .632 with a statistical significance of .01;

6) TandL (Teamwork and Leadership) and PandCR (Planning and Coordinating Resources) r = .494 with a statistical significance of .01;

7) TandL (Teamwork and Leadership) with (ERAC) Error recognition and Attitudes towards Coworkers r = .445 with statistical significance of .01;

8) WSSF (Workload with Sign Stress and Fatigue) with Pand C (Planning and Coordinating Resources) r = .536 with a statistical significance of .01;

9) WSSF (Workload with Sign Stress and Fatigue) and ERAC (Error ecognition and Attitudes towards the Coworker) r = .525 with a statistical significance of .01; and

10) PandCR (Planning and Coordinating Resources) with ERAC (Error recognition and Attitudes towards the Coworker) r = .546 with a statistical significance of .01

From the above 10 pairs of correlation Coefficient, there were 5 pairs of medium levels of correlation coefficient (r = 0.5-0.7) which were CandC/TandL, WSSF/ PandCR, WSSF/ERAC, Tand/WSSF, and PandCR/ERAC and 5 pairs of low levels of correlation coefficient (r = 0.3-0.5), which are CandC/WSSF, CandC/PandCR, CandC/ERAC, TandL/ PandCR, and TandL/ERAC.

Table 4.7 Correlations

Correlations

| | CandC | TandL | WSSF | PandCR | ERAC |
|---|---|---|---|---|---|
| CandC | 1 | | | | |
| TandL | .513** | 1 | | | |
| WSSF | .467** | .632** | 1 | | |
| PandCR | .453** | .494** | .536** | 1 | |
| ERAC | .311** | .445** | .525** | .546** | 1 |

** Correlation is significant at the 0.01 level (2-tailed).

According to Table 4.8, the analysis of variance 2 Way-MANOVA of Non-technical skill of the cabin crews in an International Airline which was Non-Technical Skills -- 1) CandC; 2) TandL; 3) WSSF; 4) PandCR; and 5) ERAC -- and Attitudes towards the Coworkers , it was found that Position had significantly impact on 4 of factors of the Non-technical Skills of the cabin Crew in an International Airline with the p value at .05 as followed: on ERAC (ρ = .044); PandCR (ρ = .041); WSSR (ρ = .039); CandC (ρ = .019); and TandL (ρ = .158) was not statistically significant.

However, sex, education, and work experiences in terms of duration of work had no effect on non-technical skills of the cabin crews in an International Airline.

Table 4.8 Multivariate analysis of Variance 2 Way MANOVA: Demographics of the Cabin Crew of an International Airline toward 5 Components of Non-technical skills

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Corrected Model | CandC | 3.817[a] | 19 | .201 | 1.492 | .084 |
| | TandL | 4.316[b] | 19 | .227 | 1.161 | .288 |
| | WSSF | 4.696[c] | 19 | .247 | 1.122 | .325 |
| | PandCR | 5.399[d] | 19 | .284 | 1.349 | .149 |
| | ERAC | 7.219[e] | 19 | .380 | 1.000 | .460 |
| Intercept | CandC | 952.773 | 1 | 952.773 | 7075.898 | .000 |
| | TandL | 813.592 | 1 | 813.592 | 4158.725 | .000 |
| | WSSF | 784.331 | 1 | 784.331 | 3561.989 | .000 |
| | PandCR | 910.306 | 1 | 910.306 | 4321.030 | .000 |
| | ERAC | 765.265 | 1 | 765.265 | 2013.489 | .000 |
| Sex | CandC | .039 | 1 | .039 | .293 | .589 |
| | TandL | .124 | 1 | .124 | .635 | .426 |
| | WSSF | .280 | 1 | .280 | 1.273 | .260 |
| | PandCR | .213 | 1 | .213 | 1.010 | .315 |
| | ERAC | .038 | 1 | .038 | .100 | .752 |

Table 4.8 Multivariate analysis of Variance 2 Way MANOVA: Demographics of the Cabin Crew of an International Airline toward 5 Components of Non-technical skills (Cont.)

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Education | CandC | .294 | 1 | .294 | 2.186 | .140 |
| | TandL | .086 | 1 | .086 | .441 | .507 |
| | WSSF | .318 | 1 | .318 | 1.444 | .230 |
| | PandCR | .020 | 1 | .020 | .093 | .761 |
| | ERAC | .110 | 1 | .110 | .290 | .590 |
| Positio | CandC | .743 | 1 | .743 | 5.515 | .019* |
| | TandL | .392 | 1 | .392 | 2.001 | .158 |
| | WSSF | .942 | 1 | .942 | 4.279 | .039* |
| | PandCR | .883 | 1 | .883 | 4.189 | .041* |
| | ERAC | 1.547 | 1 | 1.547 | 4.069 | .044* |
| Work Experience | CandC | .104 | 2 | .052 | .386 | .680 |
| | TandL | .005 | 2 | .003 | .013 | .987 |
| | WSSF | .424 | 2 | .212 | .964 | .382 |
| | PandCR | .002 | 2 | .001 | .004 | .996 |
| | ERAC | .252 | 2 | .126 | .332 | .718 |
| Error | CandC | 56.015 | 416 | .135 | | |
| | TandL | 81.384 | 416 | .196 | | |
| | WSSF | 91.601 | 416 | .220 | | |
| | PandCR | 87.638 | 416 | .211 | | |
| | ERAC | 158.109 | 416 | .380 | | |

Table 4.8 Multivariate analysis of Variance 2 Way MANOVA: Demographics of the Cabin Crew of an International Airline toward 5 Components of Non-technical skills (Cont.)

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Total | CandC | 8982.453 | 436 | | | |
| | TandL | 7600.878 | 436 | | | |
| | WSSF | 7672.688 | 436 | | | |
| | PandCR | 8558.361 | 436 | | | |
| | ERAC | 7359.000 | 436 | | | |
| Total | CandC | 8982.453 | 436 | | | |
| | TandL | 7600.878 | 436 | | | |
| | WSSF | 7672.688 | 436 | | | |
| | PandCR | 8558.361 | 436 | | | |
| | ERAC | 7359.000 | 436 | | | |
| Corrected Total | CandC | 59.831 | 435 | | | |
| | TandL | 85.701 | 435 | | | |
| | WSSF | 96.297 | 435 | | | |
| | PandCR | 93.037 | 435 | | | |
| | ERAC | 165.328 | 435 | | | |

Bartlett's Test of Sphericity Chi-square = 771.331, df = 10, ρ = .000

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .822

*(ρ <.05), **(ρ <.01), ***(ρ<.000)

a. R Squared = .064 (Adjusted R Squared = .021)

b. R Squared = .050 (Adjusted R Squared = .007)

c. R Squared = .049 (Adjusted R Squared = .005)

d. R Squared = .058 (Adjusted R Squared = .015)

e. R Squared = .044 (Adjusted R Squared = .000)

As a result as to reach an ultimate objective of this study as to examine and identify the levels of the NTS of the cabin crews, the following, hence, as shown in Table 4.9, was a preparation outline for educational training plan as to enhance safety for an International Airline.

Table 4.9 Training Plan for Non-technical Skills of the Cabin Crews of an International Airline

| TRAINING CENTER | | |
|---|---|---|
| Course Title | NON-TECHNICAL SKILLS OF CABIN CREW TO ENHANCE SAFETY | |
| Course Outline | NTS Encompasses a Wide Range of Knowledge, Skills and Attitudes that Will Help Enhance Safety in an International Airline. | |
| Objective | To enhance the skills of: 1) Error Recognition and Attitudes toward the Coworker (ERAC); 2) Planning and Coordinating Resources (PandCR); 3) Workload with Sign of Stress and Fatigue (WSSF); 4) Communication and Collaboration (CandC); and 5) Teamwork and Leadership (TandL) of the cabin crew members concerned. Emphasis will be placed on the non-technical knowledge, skills and attitudes of cabin crew as to enhance safety. | |
| Lesson Plan | Introduction of Course Outline and Class Room Policy | .5 Hour |
| | The important of Safety | 1.5 Hours |
| | Class Activities | 15 Hours |
| | Wrap up | 1 Hour |

Table 4.9 Training Plan for Non-technical Skills of the Cabin Crews of an International Airline (Cont.)

| COURSE EVALUATION | | Passing Grade |
|---|---|---|
| Assessment and evaluation will be performed as to check whether the attitudes and behaviors of the cabin crews after being trained have been changed to enhance safety. | | |
| TRAINING CENTER | | |
| LESSON PLAN | NON-TECHNICAL SKILLS OF THE CABIN CREW TO ENHANCE SAFETY | |
| Training Period | Description | Training Element |
| 30 minutes | Introduction of Course Outline and Class Room Policy | Attendant sheet |
| 1.5 Hours | The important of Safety | Reference document |
| Class Activities 18 Hours | | |
| 3 hours | Error recognition and Attitudes towards the Coworker (ERAC) | |
| 3 hours | Planning and Coordinating Resources (PandCR) | |
| 3 hours | Workload with Sign of Stress and Fatigue (WSSF) | |
| 3 hours | Communication and Collaboration (CandC) | |
| 3 hours | Teamwork and Leadership (TandL) | |
| 1 Hour | Wrap up | |
| Remark | The training is based on Group Activities, Discussions, and Role Play | |

# Chapter 5

## Summary and Conclusions

This chapter contained a summary and conclusion of the result of the research. Also, the limitations of the study were addressed. Suggestions for the future research directions on the Non-Technical Skills of cabin crew of an International Airline prepared for the educational training as to enhance safety were also included.

While the objectives of this study were to examine and identify the levels of the Non-Technical Skills (NTS) of the cabin crew in an international airline in order to plan for an educational training to enhance safety, the directions for the educational training of Non-technical skills for the cabin crews were developed accordingly.

### 5.1 The Analysis of the Non-technical Skills of the Cabin Crew of an International Airline

It appeared that the majority of the respondents was female (about two/third of total (68.5%) and the rest was male (31.5%). For education background, it is indicated that almost all of the respondents held Bachelor Degree while the rest were above with 6.2%. According to the position, 77.4% was the cabin crew, while 22.6 % was a senior one. According to working experience and duration of work, more than a half of the cabin crew had been working from 1 to 5 years was 59.8%, 6 to 10 years was 30.1%, and the rest was 10 %.

The Non-Technical Skills of the cabin crew (Gregorich & Wilhelm, 1993; Rottger et al., 2013; Sexton et al., 2006) was classified into five components: 1) Communication and Collaboration; 2) Teamwork and Leadership; 3) Workload with Sign of Stress and Fatigue; 4) Planning and Coordinating Resources; and 5) Error recognition and Attitudes towards the Coworker. It was revealed that after being

exposed to the five scales of attitudes towards Non- Technical Skills among the Cabin Crew of an International Airline, the attitudes were raised on all of the five scales as indicating from the most to the least: 1) CandC; 2) TandL; 3)WSSF; 4) PandCR; and 5) ERAC and the scales rated at strongly positive attitude (4.5-5.00), from the most to the least were: 1) Communication and Collaboration (CandC); 2) Teamwork and Leadership (TandL); 3) Workload with Sign of Stress and Fatigue (WSSF); 4) Planning and Coordinating Resources (PandCR); and 5) Error recognition and Attitudes towards the Coworkers (ERAC).

Positive attitudes were rated between 3.5-4.49, towards non-technical skills on all five scales, from the most to the least, were as follows, communication and Collaboration (CandC), Teamwork and Leadership (TandL), Workload with Sign of Stress and Fatigue(WSSF), Planning and Coordinating Resources (PandCR), Error Recognition and Attitudes(ERAC), the items involved NTS were rated from the most to the least strongly agreed as well:

1) Communication and Collaboration (CandC): 1.1) Q3 I feel comfortable going to the senior cabin crew to discuss problems or operation issues; 1.2) Q4 I experience good collaboration with cockpit crews; 1.3) Q5 I experience good collaboration with senior cabin crews; and 1.4) Q6 I experience good collaboration among cabin crews;

2) Teamwork and Leadership (TandL) which defined the issues of: 2.1) Q10 In critical situations, I rely on my superiors to tell me what to do; 2.2) Q11 I still can work well even with less capable team member; 2.3) Q12 Senior cabin crew should be effective in procedure; 2.4) Q13 My team usually support my detail efforts; 2.5) Q14 Problems among personnel are constructively managed by our superiors; and 2.6) Q15 As a crew member I should be aware that disagreeing with others could reduce crew effectiveness;

3) Workload with Sign of Stress and Fatigue (WSSF) which characterized the issues of: 3.1) Q16 Even when fatigued, I could perform effectively during critical phase maneuvers; 3.2) Q18 I always aware of unexpected situation during the flight; 3.3) Q19 Each cabin crew should recognize for the signs of stress and fatigue of other crew members then discuss the situation with each other; 3.4) Q20 We should

be aware of, and sensitive to, the personal problems of other team members; 3.5) Q21 I am less effective when stressed or fatigued; 3.6) Q22 Personal problems can insufficiently affect my performance; and 3.6) Q23 Cabin crew members should be alert of their actual or potential over-workloads;

4) Planning and Coordinating Resources (PandCR): of: 4.1) Q25 The senior cabin crew should encourage crew members to question about the procedures during normal flight operations and emergencies; 4.2) Q26 The senior cabin crew should encourage crew members to question about the procedures during emergencies; 4.3) Q27 The senior cabin crew should take control in emergency and nonstandard situations; and 4.4) Q28 Overall, successful cabin management is primarily a function of the senior cabin crew's proficiency; and

5) Error recognition and Attitudes towards the Coworker (ERAC):5.1) Q30 A debriefing and critique of procedures and decisions after each flight is important for developing and maintaining effective crew coordination; 5.2) Q31 Error are a sign of incompetence; 5.3) Q32 All the mistakes should be handled appropriately; and 5.4) Q33 It is important to avoid negative comments about the procedures and techniques of other crew members.

## 5.2 The Result of Correlation Coefficient of the Non-technical Skills Components and the Attitudes of the Cabin Crew

5.2.1 Communication and Collaboration (CandC) had a moderate correlation with Teamwork and Leadership (TandL); low level of correlation with Workload with Sign of Stress and Fatigue (WSSF), Planning and Coordinating Resources (PandCR), and Error recognition and Attitudes towards the Coworker (ERAC).

5.2.2 Teamwork and Leadership (TandL) had a moderate correlation with Workload and Sign of Stress and Fatigue (WSSF); low level of correlation with Planning and Coordinating Resources (PandCR), and Error recognition and Attitudes towards the Coworker (ERAC).

5.2.3 Workload with Sign of Stress and Fatigue (WSSF) had a moderate level of correlation with Planning and Coordinating Resources (PandCR), and Error recognition and Attitudes towards the Coworker (ERAC).

5.2.4 Planning and Coordinating Resources (PandCR) had a moderate level of correlation with Error recognition and Attitudes towards the Coworker (ERAC).

## 5.3 An Analysis of Demographic Factors -- Gender, Education, Position, and Work Experiences

In terms of the influence of the demographic factors on NTS, only position had a significantly different on four variables, respectively: Error Recognition and Attitudes towards the Coworkers (ERAC, Planning and Coordinating Resources (PandCR), and Workload with Sign of Stress and Fatigue (WSSF), and Communication and Collaboration (CandC).

## 5.4 Training Plan for Non-technical Skills of the Cabin Crew of an International Airline

As a result, displayed by the significant levels of the variables examined on NTS of the cabin crew, it can be concluded that the educational training, to enhance safety, for the cabin crew of an International Airline, should be planned and trained according to the least significance to the most. This is because, in an airline safety, the least significant skills were interpreted as the weakest skills to be prepared and urgently trained, while the rest of the skills would be, nevertheless, strengthened and maintained (IATA, 2016; ICAO, 2013). Accordingly, the skills that need to be trained were put into particular order as follows: 1) ERAC; 2) PandCR; 3) WSSR; 4) CandC; and 5) TandL.

## 5.5Research discussion

5.5.1 Correlation of Non-technical Skills of the Cabin crew

1) Correlation of Communication and Collaboration

While communication and Collaboration positively and moderately correlated with Teamwork and Leadership, it has shown that in order to complete their

task together good communication must be performed among the coworkers (Rasmussen et al., 1991), failure in collaboration, thus, is a sign of poor performance (Driskell & Salas, 1991). Especially for the cabin crews, being able to exchange information and coordinate with team members is necessary as to successfully complete their procedure and regulatory. As such, good communication which includes both verbal and non-verbal communication, body language, eye contact, and hand gestures must be promptly portrayed for clear and effective understanding among members (Cooper et al., 1980). If not, workload, stress, and fatigue could, particularly, affect communication outcome due to shorten message, mishearing, or incomplete sensory system which in consequence would cause communication failure (Cooper et al., 1980)

Before a daily flight, planning between the crews is a must to do in order to share work schedules and tactical planning for the normal flight, including procedure remedial, contingency plan, or any of uncertainty problem(s) that may occur before or during the flight as to prevent error (Marshall, 1992), this will help increase and maintain good communication and collaboration among themselves.

2) Correlation of Teamwork and Leadership

It was found that Teamwork and Leadership had a moderately positive correlation with Workload and Sign of Stress and Fatigue, but low correlated with Planning and Coordination. It could be interpreted that an effective sharing workload would, particularly, help facilitate and manage workload and stress and/or fatigue among the coworkers without disturbance from personal problems, passengers, or other uncertainty (Petrilli et al., 2006). Moreover, the more the team members having good plan and coordination, the more effective direction, purpose, and goals they can achieve (Marks et al., 2001). In order to avoid situation of conflict and error, positive attitudes among coworkers must be developed as for preventing difficulties as well as problems that might occur among them (Catchpole et al., 2008).

3) Correlation of Workload with Sign of Stress and Fatigue

Workload with Sign of Stress and Fatigue was moderately correlated with Planning and Coordinating Resource. It was noted that good planning could

facilitate and prepare for the solution of uncertainty situations during work (Marshall, 1992). Since, workload and fatigue are common in work environments (Ackerman, 2011; Hancock, 2013; Hancock & Desmond, 2001; Matthews et al., 2012), mental fatigue which comprises of both psychobiological stress caused by prolonged periods of demanding cognitive activity which characterized by subjective feelings of "tiredness" and "lack of energy" could damage work effectiveness (Boksem & Tops, 2008). While Planning and Coordination was moderately correlated with Error recognition and attitudes towards the coworker, detecting error before it occurs, would be considered one of the most effective design of future and forecasting problem, and image of the goal, it was recommended by every airline to prevent errors by having good plans of coordination among the coworkers (Vincent & Jeffrey, 2011)

5.5.2 An analysis of the Position on NTS

It has been revealed that position had a significant impact on Error Recognition and Error recognition and Attitudes of Coworkers (ERAC), Planning and Coordinating Resources (PandCR), Workload with Sign of Stress and Fatigue (WSSF), Communication and Collaboration (CandC). Generally, on their routines, the cabin crews and their senior supervisors must communicate among themselves of how to complete their tasks together. In accordance, the senior cabin crews, as the leaders, should be well trained and -organized so that they can manage their workload and error as well as any difficulties that may occur. However, because human error cannot be eliminated, but it could be reinforced to minimize, catch, and lessen to ensure appropriate non- technical skills to cope with the risks (Flin et al., 2008). Planning for an educational training, especially, as to enhance safety, among the cabin crew, was apparently necessary and beneficial for in any airline.

5.5.3 Preparation and Planning for Educational Training to Enhance Safety in Non-Technical Skills for the Cabin Crew

Apparently, training preparation and planning to enhance safety by using Non-Technical skills for the cabin crews would be necessary for any airline (Colman, 2015).

This is because of the positive attitudes of NTS had been revealed, particularly, in this study, to be salient for safety enhancement. Illuminated by the results, it was conveyed that educational training to enhance attitudes of the NTS would help prepare, create, and maintain effective work and safety. Since attitudes can be formed, changed, and/or influenced by one's social world, or vice versa, in a more or less favorable through self-persuasion towards a particular, object, or issue, accordingly, it is believed, that NTS could contribute to improve technical performance, decrease the numerous errors, and enhance safety, as well (Moriarty, 2015; Robertson et al., 2014).

1) The Benefits of the Study

As can be seen in this study that NTS was found to be salient not only in dairy routine of the cabin crew but also in critical situations and/or emergencies, the findings, in this study, hence, clarified the need for training to elevate high performance as to ensure the optimum outcomes for all the passengers undergoing any cabin service at any time and any flight.

## 5.6 Limitation

5.6.1 Because of the limited scope of this study, the sampling of this research only limited to one airline, thus, the future research should be performed and employed as to compass more variables and samplings of other airlines.

5.6.2 Since this study dealt only with the preparation and planning of the educational training, it is still at the early stage of and expectation of the outcomes of the NTS on the cabin crews as to enhance safety. In that light, it is necessary, to put the findings of this study into action to see how NTS truly work on the cabin crews, especially, through the training.

In the next step, the plan and direction of the preparation for training will be submitted to the executives and all the committee members involved in an airline as to perform the training in order to enhance safety through NTS.

## 5.7 Recommendation

For further research, the other areas of NTS to enhance airline safety, such as the cognitive skills, should be elaborated and examined. Also, other kinds of research techniques such as interviews, adverse event report analysis, and cabin crew observations should be performed as to expand and strengthen the research in NTS.

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# APPENDICES

# APPENDIX A

# EXPERTISE'S NAME LIST

**Name list of expertise to verify the accuracy and appropriation of the questionnaire**

1. **Gp.Capt. Ubonrat Raicharoen WRTAF**

**Degree** : M.S. Clinical Psychology, Siriraj Hospital, Mahidol University, Bangkok.

B.S. Psychology Chiang Mai University

**Expertise :** Clinical Psychologist Aircrew Medical standard Division, Institute of Aviation Medicine, Royal Thai Air Force.

Human Factors and Crew Resource Management Instructor, Institute of Aviation Medicine, Royal Thai Air Force.

Psychological First Aid and Resilience approach to help children, adolescents, adults, and families in the immediate aftermath of disaster and terrorism.

Lecturer : Aviation Psychology and Human Factors for Instructor Pilot, Flight Surgeon course and Flight Nurse, Royal Thai Air Force.

Aviation Psychological Testing for ATC, Mongolia, 2009 and 2015.

**Current Position :** Clinical Psychologist

**Workplace :** Aircrew Medical Standard Division, Institute of Aviation Medicine, Royal Thai Air Force

2. **Wg.Cdr.Dech Nuanta**

**Degree** : M.S. Clinical Psychology, Siriraj Hospital, Mahidol University, Bangkok.

B.S. Clinical Psychologist (HONS.), Chiang Mai University, Chiang Mai.

**Expertise :** Human Factors and Crew Resource Management Instructor. Institute of Aviation Medicine, Royal Thai Air Force.

Lecturer: Mental Health; Thai Air Force Nursing College; Royal Thai Air Force. 2014- Present

Lecturer: Human Factors in Aviation: Kasetsart University, 2007 - Present.

Lecturer: Mental Health; Thai Air Force Nursing College; Royal Thai Air Force. 2014- Present

**Current Position :** Clinical Psychologist

**Workplace :** Aircrew Medical Standard Division, Institute of Aviation Medicine, Royal Thai Air Force

3. **Sqn.Ldr.Wararat Intaptim WRTAF**

**Degree :** M.S. Clinical Psychology), Siriraj Hospital, Mahidol University, Bangkok. 2005

B.A. Psychology Thammasat University, Bangkok.

**Expertise :** Aviation Psychological Testing for ATC, Mongolia, 2015.

Lecturer : Human Factors and CRM for Student Pilot, Flight Surgeon, Flight Nurse

Lecturer: Human Factors in Aviation: Kasetsart University, 2007 - Present.

Instructor : SAT Team (Special Assistance Team),Thai Air Asia and Thai Air Asia X.

Instructor : FAST Team (Family Assistance and Support Team) Thai Smile Airways.

**Current Position :** Clinical Psychologist

**Workplace :** Aircrew Medical Standard Division, Institute of Aviation Medicine, Royal Thai Air Force

4. **Wg.Cdr.Thanayu Khamlamai**

**Degree**: Master of Management degree in Human Resource Management, University of New South Wales, Australia

**Expertise:** Lecturer in Aviation Safety Officer Course (Flight Line Safety, Aircraft Accident Investigation, and Aviation Resource Management) for Royal Thai Air Force

Lecturer in Aviation Resource Management Course (Error Management) for Royal Thai Air Force

Lecturer in Team Resource Management Course (Basic Human Error) for Aeronautical Radio of Thailand

Co-lecturer in Aviation Human Resource and Organization at Ratanabandit University

**Current Position :** Safety Risk Management Manager

**Workplace:** Thai Airasia

**5. Mr.Karn Sakulkijkarn**

**Degree**: M.S. Aviation Management **,**Civil Aviation Training Center, Bangkok.

**Expertise:** Crew Resource Management for Pilot and Cabin Crew

**Current Position :** Crew Resource Management Instructor

**Workplace:** Thai Airasia

**Table 1** The result of Index of item objective congruence: IOC

| Items | Point | | | | | Total | IOC | Result |
|---|---|---|---|---|---|---|---|---|
| | Person1 | Person2 | Person3 | Person 4 | Person 5 | | | |
| *Communication and collaboration* | | | | | | | | |
| 1. Good communication is important. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 2. Crew coordination is important. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 4. I experience good collaboration with cockpit crews and senior cabin crews. | 0 | +1 | 0 | 0 | +1 | 2 | 0.40 | Not Complied |
| 5. I experience good collaboration among cabin crews. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 6. To resolve conflicts, team members should openly discuss their differences with each other. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 7. The pre-briefing is important for safety and for effective team management. | 0 | +1 | +1 | +1 | +1 | 4 | 0.80 | Not Complied |
| *Teamwork and Leadership* | | | | | | | | |
| 8. The senior cabin crew's responsibilities include coordination of cabin crews and flight crews' activities. | +1 | +1 | 0 | 0 | -1 | +1 | 0.20 | Not Complied |
| 9. Good crew member should follow chain of command. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 10. In critical situations, I rely on my superiors to tell me what to do. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 11. My performance is not adversely affected by working with an inexperienced or less capable team member. | +1 | +1 | +1 | +1 | 0 | 4 | 0.80 | Complied |

| Items | Point | | | | | Total | IOC | Result |
|---|---|---|---|---|---|---|---|---|
| | Person1 | Person2 | Person3 | Person 4 | Person 5 | | | |
| 12. Senior cabin crew should not dictate cabin procedures to their cabin crews. | +1 | +1 | +1 | 0 | +1 | 4 | 0.80 | Complied |
| 13. Superiors support my detail efforts. | +1 | +1 | +1 | +1 | 0 | 4 | 0.80 | Complied |
| 14. Problem personnel are dealt with constructively by our superiors. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 15. Even when fatigued, I performed effectively during critical phase maneuvers. | +1 | +1 | +1 | +1 | 0 | 4 | 0.80 | Complied |
| 16. Cabin Crews should be aware of their own psychological stress or physical problems before or during flight. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 17. I always aware of unexpected situation during flight. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 18. Crew members should be aware that disagreeing with others could reduce crew effectiveness. | +1 | +1 | +1 | +1 | -1 | 3 | 0.60 | Complied |
| *Planning and Coordinating Resources* | | | | | | | | |
| 19. The senior cabin crew should be clear in terms of plans and procedures. | +1 | +1 | 0 | 0 | +1 | 3 | 0.60 | Complied |
| 20. The senior cabin crews should encourage crew members to question procedures during normal flight operations and emergencies. | 0 | +1 | 0 | 0 | +1 | 2 | 0.40 | Not Complied |
| 21. The senior cabin crews should take control in emergency and nonstandard situations. | +1 | +1 | 0 | 0 | 0 | 2 | 0.40 | Not Complied |
| 22. Overall, successful cabin management is primarily a function of the senior cabin crew's proficiency. | +1 | +1 | +1 | +1 | -1 | 3 | 0.60 | Complied |

| Items | Point | | | | | Total | IOC | Result |
|---|---|---|---|---|---|---|---|---|
| | Person1 | Person2 | Person3 | Person 4 | Person 5 | | | |
| 23. Team members share responsibilities for prioritizing activities in high workload situations. | +1 | +1 | 0 | +1 | +1 | 4 | 0.80 | Complied |
| *Error recognition and Attitudes toward the Coworker* | | | | | | | | |
| 24. A debriefing and critique of procedures and decisions after each flight is important for developing and maintaining effective crew coordination. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 25. Error are a sign of incompetence | +1 | +1 | +1 | +1 | -1 | 3 | 0.60 | Complied |
| 26. All the mistakes should be handled appropriately. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 27. It is important to avoid negative comments about the procedures and techniques of other crew members. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 28. Cabin crew members should be alert of their actual or potential over-workloads. | +1 | +1 | 0 | +1 | -1 | 2 | 0.40 | Not Complied |
| *Sign of stress and fatigue* | | | | | | | | |
| 29. Each cabin crew should recognize for the signs of stress and fatigue of other crew members then discuss the situation with the crew members | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 30. We should be aware of, and sensitive to, the personal problems of other team members. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |
| 31. I am less effective when stressed or fatigued. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |

| Items | Point | | | | | Total | IOC | Result |
|---|---|---|---|---|---|---|---|---|
| | Person1 | Person2 | Person3 | Person 4 | Person 5 | | | |
| 32. Personal problems can insufficiently affect my performance. | +1 | +1 | +1 | +1 | +1 | 5 | 1.00 | Complied |

After verify the accuracy and appropriation of the questionnaire by to 5 experts, the result which include scholars in the field of Education and professionals in Aviation in the line of Safety Enhancement as to verify its validity: The scales for the verification of the questionnaire items are:

The result of a qualitative query of the content compliance questionnaire by Index of item objective congruence: IOC from a qualified 5 experts has found that the results of the questionnaire content are evaluated 32 items. 26 items were found IOC ≥ 0.5. There are a number of the average IOC equivalent are 0.80. The questions are consistent with the purpose of this update. Adjust the speech language, wrap words to be appropriate according to experts' suggestion, and rearrange the order of the questions completely.

Analyze their reliability by Alpha coefficient of Cronbach as table below.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .925 | 33 |

# APPENDIX B

# IOC INVITATION LETTERS

มหาวิทยาลัยรังสิต
RANGSIT UNIVERSITY

Rangsit University
Phahonyothin Rd.
Pathumthani 12000, Thailand

วิทยาลัยครูสุริยเทพ
ที่ วสท. 4800/039

3 กันยายน 2561

**เรื่อง** ขอความอนุเคราะห์เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย

**เรียน** นางอากาศเอกหญิง อุบลรัตน์ หร่ายเจริญ

**สิ่งที่แนบมาด้วย** แบบสอบถาม จำนวน 1 ฉบับ

เนื่องด้วยนายอาทร ขวัญสังข์ รหัส 5710576 นักศึกษาปริญญาเอก หลักสูตรศึกษาศาสตรดุษฎีบัณฑิต สาขาวิชาการศึกษา คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต กำลังศึกษาและทำดุษฎีนิพนธ์ เรื่อง "ทักษะรอบด้านของบุคคลในลูกเรือเพื่อเพิ่มความปลอดภัยในการเตรียมพร้อมการอบรมทางวิชาการของสายการบินนานาชาติ" "Non-Technical Skills of Cabin Crew to Enhance Safety: Preparation for Educational Training of an International Airline" โดยมีอาจารย์ที่ปรึกษาคือ ดร.พิมพ์อุไร สัมปทังก์

คณะศึกษาศาสตร์ ได้พิจารณาเห็นว่าท่าน เป็นผู้มีความรู้ความสามารถในเรื่องนี้โดยเฉพาะ และคำแนะนำของท่านจะเป็นประโยชน์ ต่อการสร้างแบบสอบถามในการวิจัยของนักศึกษา ในการนี้คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต ใคร่ขอความอนุเคราะห์ท่าน เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย ให้นักศึกษาดังกล่าว

จึงเรียนมาเพื่อโปรดพิจารณาอนุเคราะห์ในการตรวจสอบแบบสอบถามในการวิจัย จักเป็นพระคุณยิ่ง

(ดร.พิมพ์อุไร สัมปทังก์)
รองคณบดีฝ่ายกิจการพิเศษ
ผู้ช่วยการหลักสูตรศึกษาศาสตรดุษฎีบัณฑิต
มหาวิทยาลัยรังสิต

เบอร์ติดต่อผู้ประสานงานหลักสูตร 02 997 2222 ต่อ 1,275
เบอร์ติดต่อผู้วิจัย 089-168-6565

RSU มหาวิทยาลัยรังสิต
มหาวิทยาลัยรังสิต Rangsit University
หลักสี่ กรุงเทพฯ 10210 Phahonyothin Rd., Lak-Si, Bangkok 10210 Thailand

**วิทยาลัยครูสุวิยเทพ**
ที่ วสท. 4800/040

3 กันยายน 2561

**เรื่อง** ขอความอนุเคราะห์เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย

**เรียน** นายธนายุ ข้าละม้าย

**สิ่งที่แนบมาด้วย** แบบสอบถาม จำนวน 1 ฉบับ

เนื่องด้วยนายธาดรี ชวัญสังข์ รหัส 5710576 นักศึกษาปริญญาเอก หลักสูตรศึกษาศาสตรดุษฎีบัณฑิต สาขาวิชาการศึกษา คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต กำลังศึกษาและทำดุษฎีนิพนธ์ เรื่อง "ทักษะรอบด้านของบุคคลในลูกเรือเพื่อเพิ่มความปลอดภัยในการเตรียมเพรียมการอบรมทางวิชาการของสายการบินนานาชาติ" "Non-Technical Skills of Cabin Crew to Enhance Safety: Preperation for Educational Training of an International Airline" โดยมีอาจารย์ที่ปรึกษาคือ ดร.พิมพ์อุไร อิมปพัทธ์

คณะศึกษาศาสตร์ ได้พิจารณาเห็นว่าท่าน เป็นผู้มีความรู้ความสามารถในเรื่องนี้โดยเฉพาะ และคำแนะนำของท่านจะเป็นประโยชน์ ต่อการสร้างแบบสอบถามในการวิจัยของนักศึกษา ในการนี้คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต ใคร่ขอความอนุเคราะห์ท่าน เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย ให้นักศึกษาดังกล่าว

จึงเรียนมาเพื่อโปรดพิจารณาอนุเคราะห์ในการตรวจสอบแบบสอบถามในการวิจัย จักเป็นพระคุณยิ่ง

(ดร.พิมพ์อุไร อิมปพัทธ์)
รองคณบดีฝ่ายบริหารทั่วไป
ผู้อำนวยการหลักสูตรศึกษาศาสตรดุษฎีบัณฑิต
มหาวิทยาลัยรังสิต

เบอร์ติดต่อผู้ประสานงานหลักสูตร 02 997 2222 ต่อ 1275
เบอร์ติดต่อผู้วิจัย 089-168-6565

มหาวิทยาลัยรังสิต Rangsit University
Rangsit University
Rangsit Ave. Muangchan Rd.
Pathumthani 12000 Thailand

วิทยาลัยครุศาสตร์
ที่ วศท. 4800/041

3 กันยายน 2561

**เรื่อง** ขอความอนุเคราะห์เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย

**เรียน** นายกานต์ อนุอริยกานต์

**สิ่งที่แนบมาด้วย** แบบสอบถาม จำนวน 1 ฉบับ

เนื่องด้วยนายสาธร ชวัญสังข์ รหัส 5710576 นักศึกษาปริญญาเอก หลักสูตรศึกษาศาสตรดุษฎีบัณฑิต สาขาวิชาการศึกษา คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต กำลังศึกษาและทำดุษฎีนิพนธ์ เรื่อง "ทักษะรอบด้านของบุคคลในลูกเรือเพื่อเพิ่มความปลอดภัยในการเตรียมฝึกอบรมการอบรมทางวิชาการของสายการบินนานาชาติ" "Non-Technical Skills of Cabin Crew to Enhance Safety: Preparation for Educational Training of an International Airline" โดยมีอาจารย์ที่ปรึกษาคือ ดร. พิมพ์อุไร ศิลปพิพัฒน์

คณะศึกษาศาสตร์ ได้พิจารณาเห็นว่าท่าน เป็นผู้มีความรู้ความสามารถในเรื่องนี้โดยเฉพาะ และคำแนะนำของท่านจะเป็นประโยชน์ต่อการสร้างแบบสอบถามในการวิจัยของนักศึกษา ในการนี้คณะศึกษาศาสตร์ มหาวิทยาลัยรังสิต ใคร่ขอความอนุเคราะห์ท่าน เป็นผู้ทรงคุณวุฒิตรวจสอบแบบสอบถามในการวิจัย ให้นักศึกษาดังกล่าว

จึงเรียนมาเพื่อโปรดพิจารณาอนุเคราะห์ในการตรวจสอบแบบสอบถามในการวิจัย จักเป็นพระคุณยิ่ง

ดร. พิมพ์อุไร ศิลปพิพัฒน์
รองคณบดีฝ่ายกิจการพิเศษ
ผู้ช่วยอธิการหลักสูตรศึกษาศาสตรดุษฎีบัณฑิต
มหาวิทยาลัยรังสิต

เบอร์ติดต่อผู้ประสานงานหลักสูตร 02 997 2222 ต่อ 1275
เบอร์ติดต่อผู้วิจัย 089-168-6365

# APPENDIX C

# RESEARCH INSTRUMENTS

# Questionnaire

Subject: "Non-Technical Skills of Cabin Crew to Enhance Safety: Preparation for Educational Training of an International Airline"

This is a part of research for Doctoral Degree Program in Faculty of Education, Educational Studies, Rangsit University. Your answers would not only benefit to specific airlines in safety development, but also entire aviation industry.

Explanation:

1. A questionnaire is divided in 2 sections

   Section 1: Personnel Status of Respondent.

   Section 2: Non-technical Skills Practice of the Cabin Crew.

The researcher is deeply appreciated for spending time to give us useful information for further safety development.

Section1: Personnel Status of Respondent.

Explanation: Please check ☑ according to an appropriate choice for you.

| | |
|---|---|
| Gender | ☐ Male ☐ Female |
| Education | ☐ Bachelor Degree<br>☐ Above Bachelor Degree |
| Position | ☐ Cabin Crew<br>☐ Senior Cabin Crew |
| Work Experiences | ☐ 1-5 Years<br>☐ 6-10 Years<br>☐ More than 10 Years |

Section2: Non-technical Skills Practice of the Cabin Crew.

Please check ☑ for the most appropriate choice according to your experiences. There is no right or wrong answer, check only one option for each item in the questionnaire.

Use the scale below to answer each question.

5 = Strongly Agree; 4 = Agree; 3 = Neutral; 2 = Disagree; 1 Strongly Disagree

| **Non-technical skills practice** | Strongly Disagree 1 | Disagree 2 | Neutral 3 | Agree 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| **Communication and Collaboration** | | | | | |
| 1. Good communication is important. | | | | | |
| 2. Crew coordination is important. | | | | | |
| 3. I feel comfortable going to the senior cabin crew to discuss problems or operation issues. | | | | | |
| 4. I experience good collaboration with cockpit crews. | | | | | |
| 5. I experience good collaboration with senior cabin crews. | | | | | |
| 6. I experience good collaboration among cabin crews. | | | | | |
| 7. To resolve conflicts, team members should openly discuss their differences with each other. | | | | | |
| 8. The pre-flight briefing is important for safety and for effective team management. | | | | | |
| **Teamwork and Leadership** | | | | | |
| 9. Good crew member should follow chain of command. | | | | | |
| 10. In critical situations, I rely on my superiors to tell me what to do. | | | | | |
| 11. I still can work well even with less capable team member. | | | | | |
| 12. Senior cabin crew should be effective in procedure. | | | | | |
| 13. My team usually support my detail efforts. | | | | | |
| 14. Problems among personnel are constructively managed by our superiors. | | | | | |
| 15. As a crew member I should be aware that disagreeing with others could reduce crew effectiveness. | | | | | |
| **Workload with Sign of stress and fatigue** | | | | | |

| Non-technical skills practice | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 16. Even when fatigued, I could perform effectively during critical phase maneuvers. | | | | | |
| 17. Cabin Crews should be aware of their own psychological stress or physical problems before or during the flight. | | | | | |
| 18. I always aware of unexpected situation during the flight. | | | | | |
| 19. Each cabin crew should recognize for the signs of stress and fatigue of other crew members then discuss the situation with each other. | | | | | |
| 20. We should be aware of, and sensitive to, the personal problems of other team members. | | | | | |
| 21. I am less effective when stressed or fatigued. | | | | | |
| 22. Personal problems can insufficiently affect my performance. | | | | | |
| 23. Cabin crew members should be alert of their actual or potential over-workloads. | | | | | |
| **Planning and Coordinating Resources** | | | | | |
| 24. The senior cabin crew should be clear in plans and procedures. | | | | | |
| 25. The senior cabin crew should encourage crew members to question about the procedures during normal flight operations and emergencies. | | | | | |
| 26. The senior cabin crew should encourage crew members to question about the procedures during emergencies. | | | | | |
| 27. The senior cabin crew should take control in emergency and nonstandard situations. | | | | | |
| 28. Overall, successful cabin management is primarily a function of the senior cabin crew's proficiency. | | | | | |
| 29. Team members share responsibilities for prioritizing activities in high workload situations. | | | | | |
| **Error recognition and Attitudes towards the Coworker** | | | | | |
| 30. A debriefing and critique of procedures and decisions after each flight is important for developing and maintaining effective crew coordination. | | | | | |

| **Non-technical skills practice** | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 31. Error are a sign of incompetence. | | | | | |
| 32. All the mistakes should be handled appropriately. | | | | | |
| 33. It is important to avoid negative comments about the procedures and techniques of other crew members. | | | | | |

Thank You for Your Cooperation.

# Biography

| | |
|---|---|
| Name | Thatri Kwansang |
| Date of birth | March 6, 1968 |
| Place of birth | Chonburi, Thailand |
| Education background | Royal Thai Air Force Academy<br>Bachelor of Science in Electrical Engineering, 1991<br>Central Missouri State University, U.S.A.<br>Master of Science in Aviation Safety, 1999<br>Rangsit University<br>Doctor of Education in Educational Studies, 2019 |
| Address | 978/197 Liabklongrangsit Rd., Prachatipat, Thanyaburi, Pratumthani 12130<br>Tel. 089-168-6565 |
| Email Address | thatri27@gmail.com |
| Place of work | Thai AirAsia Co., Ltd.<br>No.222, Don Mueang International Airport<br>3rd Floor, Central Office Building,<br>Sanambin, Don Mueang, Bangkok 10210<br>Tel. (66) 2 5625850 |
| Work position | Head of Safety, Thai AirAsia |