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Enhancing Onboard Safety: Planning for the Non-Technical Skills Training of the Cabin Crews of an International Airline

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Abstract
The objective of this study was to identify the levels of Non-Technical Skills (NTS) of the cabin crews of an international airline in order to plan for safety-enhancing educational training. The following five NTS components were tested: communication and collaboration (CandC), workload with sign of stress and fatigue (WSSF), planning and coordinating resources (PandCR), error recognition and attitudes toward coworkers (ERAC), and teamwork and leadership (TandL). A survey questionnaire was used to collect data. 438 valid responses were returned. Descriptive statistics were utilized to describe frequencies, percentages, means, and standard deviations. Inferential statistics were tested using multivariate analysis of variance: 2-Way MANOVA. The results reveal that cabin crew members with different demographics in terms of gender, education, position, and work experience exhibit different attitudes towards NTS required as part of their duties. However, only position has a significant impact on four of the five NTS components (CandC, WSSF, PandCR, and ERAC). This is reflected in the consecutive orders of NTS. CandC were perceived as the most prominent, followed by WSSF and PandCR, with ERAC further behind. It is clear from this study that incorporating NTS as part of the mandatory training and preparation of cabin crew members to enhance safety on board therefore has become a necessity for every airline.

Keywords: Non-Technical Skills, Enhanced Safety, Cabin Crew, Planning for Educational Training, International Airline

1. Introduction

Safety is regarded as crucial to any occupations, be it avoiding death, injury, illness, damage to, or loss of equipment, property, or the environment (Department of Defense-DOD, 2012; Ocampo & Klaus, 2016; Sojka, 2020). This is especially the case with public transportation, in particular aviation. The International Civil Aviation Organization (ICAO) (2013) defines safety as the state in which the possibility of harm to persons or of damage to property is reduced to and maintained at or below an acceptable level through a continuing process of hazard identification and safety risk management. In the case of commercial airlines, this means that a well-designed safety performance process and management must be implemented in a way that prevents all kinds of hazardous incidents and situations (Karatepe & Vatankhah, 2014; Van Waeyenberg & Decramer, 2018). Regarding cabin safety, obviously, the safety process must also effectively include both the physical and mental fitness of pilots, engineers, and cabin crew members, who are jointly responsible for the safe carriage of thousands of passengers each day (The British Psychological Society, 2017). Cabin crew members play a key role in providing excellent customer service and ensuring their safety.

The European Aviation Safety Agency (EASA) (2014) defines cabin crews as appropriately qualified and skilled crew members assigned by an operator to perform duties relating to the safety of passengers and flight during operations. They include senior and junior cabin crew members, inflight supervisors, and chief pursers, As the front-line staff, they are directly responsible for the well-being of passengers. For all these reasons, they are expected to possess solid traits of character, all of which essential to the safety and well-being of those on board and to the provision of good services. These traits manifest themselves in their attitude, behavior, action, and efficiency (Matos, Simpson, & Simmons, 2017). Still, notwithstanding these expectations, it is not unusual for cabin crew members working on long-haul flights to encounter difficulties and experience both physical and emotional exhaustion as it is their responsibility to deal with passenger requests at any time (Appiah-Adu, Fyall, & Singh, 2000). While on duty, under the pilot-in-command, cabin crew members must be able to cope with both routine and uncommon situations so as to prevent to the extent possible any inflight problems that may occur and affect the safety and well-being of passengers (International Civil Aviation Organization-ICAO, 2014). It goes without saying that exhibiting and upholding physical and mental health during the flight is paramount to keeping both passengers and crew members safe from any unexpected incidents or potential threats, including terrorism (Salas, Rhodenizer, & Bowers, 2000; Salas et al., 2006).

In order to maintain job efficacy, it is therefore necessary for cabin crews to be extremely well trained and prepared. This is all the more necessary as around 80 percent of the uncommon situations and/or accidents that occur in the cabin and present risks to human beings are caused by human action rather than by technical glitches (Helmrich, 2000; International Air Transport Association-IATA, 2016; Reason, 1990). Since a high level of performance and physical and mental robustness is required to prevent hazards and accidents from occurring in the cabin, human factors training designed to enhance cabin safety is highly recommended (ICAO, 2013, 2014; IATA, 2015). This has led to a focus in the last two decades on human factors and on so-called non-technical skills (NTS). Given the amount of attention NTS have received, they have now been integrated into most aviation training curricula due to their recognized high impact in preventing and vindicating induced risks (Defence Flight Safety Bureau-DFSB, 2019). The main reason they are now part of most airlines' training programs is because NTS training programs cover essential aspects of the onboard performance of crew members, namely, skills used in human interaction, decision making, communication and collaboration, teamwork and leadership, workload with sign of stress and fatigue, planning and coordinating resources, and error recognition and attitudes towards coworkers (Civil Aviation Authority Safety-CASA, 2012, 2019; DFSB, 2019; Flin & Maran, 2015).

These dimensions positively impact the attitude and performance of cabin crews in that they help reduce the risks of accidents, injuries, as well as illnesses of all the parties involved (Cheyne et al., 1998; DFSB, 2019; Glendon & Stanton, 2000; Reiman & Oedewald, 2002; Sexton & Klinect, 2017; Williamson et al., 1997; Zohar, 1980). While the existing body of literature on NTS has made it abundantly clear that NTS do make a difference between acceptable and outstanding performances in terms of safety care and technical knowledge and skills (Civil Aviation Authority-CAA, 2006; Flin & Michell, 2008; Bonsall & Taylor, 2011; ICAO, 2014) empirical research on NTS training itself is scant (Rutherford, Flin, & Mitchell, 2012; Flin, O' Corner, & Crichton, 2008). This is precisely why research on this issue, especially with regard to cabin crew members, has been urged, among others, by Aviation Authorities and some academics in the field of aviation safety (CAA, 2006; Rutherford et al., 2015; Kanki, Helmreich, & Anca, 2010). Since cabin crews are the front-line cabin staff assigned to take care of the safety and well-being of passengers, research on the effects of NTS training and whether it generates and strengthens a positive attitude towards effective safety

skills and performance is considered crucial. This is precisely the reason why this study focuses on NTS safety training for cabin crews. In line with the recommendations made by various Aviation Authorities and researchers (CASA, 2012; Civil Aviation Authority-CAA, 2013; ICAO, 2014, CAA, 2006; Rutherford et al., 2015; Flin et al., 2008), it looks at the attitude of the cabin crew members of a Thai-based international airline towards NTS. Specifically, relying on the following demographic variables, gender, educational background, position, and work experience, it aims to identify the various attitudes of its cabin crew members towards NTS and, based on their NTS strengths and weaknesses, to determine the consecutive order in which the outcome variables (the skills required) could be accurately incorporated into the NTS training planning so as to develop more effective human factors for better in-flight services. To attain these objectives, the following research questions have been formulated:

1. Is the attitude of the cabin crew members of an international airline towards NTS significantly affected by their demographic variables?
2. What consecutive order in terms of NTS strengths and weaknesses can be derived from the identified attitudes of the cabin crew members of an international airline and be applied to their planned NTS training?

2. Review of Relevant Literature

The operative concepts in this study relate to safety on board planes and the acquisition of the necessary skills to ensure safe flights.

- Safety and Safety Culture

Safety has been defined in different ways depending on its function and circumstances (Antonsen, Nilsen, & Almklov, 2017; Berman et al., 2017; Pan & Hildre, 2017; Vilbrandt, 2017 et al.). Whereas the Oxford Online Dictionary (2017) defines safety as a condition of being protected from or unlikely to cause danger, risk, or injury, some researchers define it as the freedom from any conditions of death, injury, occupational illness, damage to or loss of equipment, property, and environment which helps avoid danger or harm of unexpected, unintended injury, or events as well as accident (e.g. Loimer & Guarnieri, 1996; DoD, 2012; Burke et al., 2006; Ocampo & Klaus, 2016; Silva, 2017; Sojka, 2020). In aviation, however, safety has been defined as a state in which a possibility of harm and/or damage can be handled, minimized, and managed to a minimum or at an acceptable level of no harm to any humans or properties (ICAO, 2013). In particular, in commercial airlines, safety is regarded as important not only to the policies, management, systems, and structures of the organizations (Blazsin & Guldenmund, 2015; Gergen, 2001; Silbey, 2009) but also to workers' attitudes and performance in that the more safety training they will have the more successful their work is likely to be (Choudhry, Fang, & Mohamed, 2007; Edwards, Davey, & Armstrong, 2013; Guldenmund, 2000; Haukelid, 2008; Hsieh, 2010; Levering, 2016; Nyarugwe, 2016; Pant & Alberti, 1997; Warrick, 2017; Warszawska & Kraslawski, 2016; Xie et al., 2017).

- Non-Technical Skills in Aviation and Cabin Safety

Non-technical skills (NTS) refer to cognitive and interpersonal skills that assist in effective leadership, communication, teamwork, status awareness, decision-making, and role-sharing skills among the members of a team in their daily routine and in uncommon situations (Flin & Maran, 2015). In the aviation field, Wiener and Nagel (1988) were the first to show the importance of NTS regarding cockpit organization, crew interaction, crew fitness and judgment, and automation. At the origin of the focus on NTS was the crash of Flight 410 in March 1988, shortly after its departure from a Colombian airport (there was no survivor). The fatal crash prompted a renewal of interest in pilots and those working in high-risk careers as well as in cabin crew members as candidates for NTS training. Given that cabin safety depends on in-flight practice involving pilots and other crew members, procedures, machine interface,

and experienced professionals, human interactions among crew members are essential to help decrease the probability of errors caused by human factors (Carayon, Murphy, & Robertson 2014; Moriarty, 2015). Thus, in order to overcome the obstacles that may arise in the cabin from human factors, cabin crews need to acquire effective NTS i.e., behaviors and performances apt to influence for the safety and well-being of passengers (ICAO, 2014). This includes their attitudes towards those skills (Flin et al., 2003; Flin, & Maran, 2015).

- NTS Components

As determined by Flin et al. (2003) and Flin et al. (2008), NTS include the following five components:

- *(i) Communication and Collaboration (CandC):* This component refers to the exchange of information, feedback or response, ideas and feelings that provides knowledge, institutes relationships, and establishes predictable behavior patterns. As a management tool in promoting collaboration among the workers, it involves attention to the task.
- *(ii) Teamwork and Leadership (TandL):* This second component involves leading the activities of team members, assessing performance, assigning tasks, developing team knowledge, skills, and abilities, establishing a positive team atmosphere, exchanging information, supporting others, and solving conflicts arising out any given situation as a team.
- *(iii) Workload with Sign of Stress and Fatigue (WSSF):* This third component relates to coping with stress and fatigue – the state of tiredness associated with long hours of work, prolonged periods without sleep, and work at times that is supposed to be for sleeping – identifying symptoms of fatigue, recognizing effects of fatigue, and implementing coping strategies.
- *(iv) Planning and Coordinating Resources (PandCR):* This fourth component pertains to planning and prioritizing to prevent workload peaks or depressions and organizing task sharing, cooperating, and delegation.
- *(v) Error Recognition and Attitudes towards Coworkers (ERAC):* This fifth component includes automation management, contingency, environment, statements of plans and changes, problem identification, monitoring and cross-checking, recognizing and understanding others, and exercising vigilance.

- Planning of NTS Training for International Airlines' Cabin Crews

The main purpose of NTS training is to enhance safety, reduce the risk of accidents, and optimize safety performance by improving knowledge, skills and behaviors, strengthening teamwork, and outlining the need for a full integration of this non-technical training with existing technical training programs (Guldenmund, 2000; Haukelid, 2008; Hsieh, 2010; Levering, 2016; Nyarugwe, 2016). The ICAO (2014) requires high-skill level human factor training for pilots, cabin crews and other safety-critical personnel along with the acquisition of human factor theoretical concepts concerning errors and consequences (CASA, 2012). NTS training must include decision-making and social skills and maintaining situational awareness. It complements knowledge, technical skills, and abilities to help crew members to make things go right instead of focusing entirely on trying to eliminate the things that go wrong (DFSB, 2019; Paris, Salas, & Cannon-Bowers, 1999; CASA, 2012).

Other than that, each training session must be planned according to the theoretical and practical frameworks for preparing crews. This means that training should be objective rather than activity driven so that participants are taught the right skills and behavior and should cover the five NTS components so as to strengthen crew members' appropriate attitude and performance while on duty (CAA, 2013; ICAO, 2014). Also, of great import here, NTS training should be systematically assessed, especially by the airline providing it, in order to determine whether it has achieved its goals and reach the level of expectations targeted, most notably in terms of elevating safety performance (Cooper, White, & Lauber, 1980; Moriarty, 2015). Moreover, it is strongly recommended that before proceeding with the NTS training for the

crew staff, an analysis assessing the levels and orders of significance should be conducted and error management measures put in place. The groups or individuals to target and how this can be done should be clearly established (CASA, 2019). In this study, the planning of NTS training was conducted at the preliminary stage and the significant levels of NTS skills to be put into consecutive orders identified. Thus, by following the recommendations and guidelines of Aviation Authorities and those found in the relevant research body on the field of aviation safety, it is expected that in this study, findings on the significant levels of NTS will help place the right consecutive orders, which range from the weakest to the strongest skills, into educational training plans so as to ensure effective use of the human factors and enhance safety and in-flight services for all passengers.

3. Research Methodology

Convenient sampling and the stratified random sampling technique were applied to the 1123 cabin crew members of an international airline based at Don Mueang airport (DMK) in Bangkok, and at Chiang Mai (CNX) and Phuket (HKT) airports in Northern and Southern Thailand respectively. The sample size was determined based on Kanchanawasri, Pittayanon, and Srisukho's (2016) findings at the confidence level of 99 percent, with a margin error at ± 5 percent. The ideal sample size was 438. A 33-item survey questionnaire was used. It was adapted from: (i) the Cockpit Management Attitude Questionnaire-CMAQ (Gregorich & Wilhelm, 1993); (ii) Ship management Attitudes Questionnaire-SMAQ (Röttger, Vetter, & Kowalski, 2013); and (iii) Safety Attitudes Questionnaire-SAQ (Sexton, Helmreich, & Neilands, 2006). Five experts confirmed the content validity of the questionnaire at the level of 0.80. A pretest was conducted with 33 samples outside the sample analyzed using Cronbach Alpha Coefficient. It revealed a high reliability of 0.925.

Part One of the questionnaire pertains to the demographic variables of the respondents, (i.e., gender, levels of education, position, and work experience). Part Two includes 33 NTS-related items, ranked from Strongly Positive attitude = 5 to Strongly Negative Attitude = 1., and sub-grouped into the following 5 components: (i) Communication and Collaboration (CandC), items 1-8; (ii) Teamwork and Leadership (TandL), items 9-15; (iii) Workload with Sign of Stress and Fatigue (WSSF), items 16-23; (iv) Planning and Coordinating Resources (PandCR), items 24-29; and (v) Error recognition and Attitudes towards Coworkers (ERAC), items 30-33. A descriptive analysis that includes means, standard deviations, frequencies, percentages, correlations, and 2-Way MANOVA was run to analyze the data. The reason MANOVA was used in this study is because it was most appropriate for assessing group differences on the set of variables (Huberty & Olejnik, 2006). It is also useful for multiple responses to a single data point (e.g. males and females) and for testing the five NTS, i.e., CandC, TandL, WSSF, PandCR, and ERAC. Moreover, it could be used to examine how the groups differed on a linear combination of the different measures (Huang, 2019)

4. Research Findings and Discussion

Table 1 shows the demographics of the sampling, which consisted of 438 cabin crew members of an international airline. A majority of the respondents was female (68.50%). Almost all the respondents have a bachelor's degree (93.80%). Two-thirds of the staff members are cabin crew members (77.40%) and 22.60 percent are senior cabin crew members. In terms of working experience, more than half (59.80%) have been working for 1 to 5 years, 30.10 percent for 6 to 10 years and 10.10 percent for more than 10 years.

Table 1: Demographics of Respondents

(n=438)

Frequency and percentage of respondents			
Demographics of respondents		Frequency	Percentage
Gender	Male	138	31.50
	Female	300	68.50
Degrees	Bachelor's Degree	411	93.80
	Above Bachelor	27	6.20
Position	Cabin Crew	339	77.40
	Senior Cabin Crew	99	22.60
Working Experiences	1-5 Years	262	59.80
Duration of work	6-10 Years	132	30.10
	More Than 10 Years	44	10.10

Source: created by the author of this study

Table 2 shows the means and standard deviations for the five measurements of cabin crew members' NTS. It indicates that the means were slightly high (ranging from 4.06 for ERAC to 4.52 for CandC) and the standard deviations rather low (ranging from 0.580 from CandC to 0.850 for ERAC). Given that NTS on the questionnaire range from 1.00-5.00, the 4.06-4.52 range implies that almost all cabin crew members in the sample had high average NTS scores. Moreover, with a high mean ($\bar{x}$ = 4.17) and a low standard deviation (S.D. = 0.746), the variation analysis results were congruent with those of the whole sample. A MANOVA statistical analysis requires intercorrelation among all the dependent variables. When the dependent variables are at least moderately corelated, MANOVA will generally yield greater power in understanding outcome variables as a system rather than isolate measurement (Huberty & Morris, 1989). The intercorrelation among the 5 NTS components indicate that all of them were significantly correlated with Bartlett's Test Sphericity Chi-square = 771.331, df = 10, p = 0.000). Under the principle of statistical analysis, MANOVA requires a moderate intercorrelation among all dependent variables. Table 2 matrix shows that there were positive correlations among all 5 components ranging from 0.311- .632 with $p = \leq .01$, and n = 438. WSSR and TandL were the most correlated at 0.632 and ERAC and Tand L at 0.311.

Table 2: Intercorrelation Matrix of all 5 NTS with Means and Standard Deviations

(n=438)

	CandC	**TandL**	**WSSF**	**PandCR**	**ERAC**	**Mean**	**SD**	**Test of Normality**	
								Statistic	**Significance**
CandC	1					**4.52^{SPA}**	**0.580**	0.907	0.000
TandL	.513**	1				4.15^{PA}	0.725	0.972	0.000
WSSF	.467**	.632**	1			4.17^{PA}	0.767	0.973	0.000
PandCR	.453**	.494**	.536**	1		4.06^{PA}	0.653	0.926	0.000
ERAC	.311**	.445**	.525**	.546**	1	**4.06^{PA}**	**0.850**	0.954	0.000
Total						4.17^{PA}	0.746		

Notes: 1. SPA = Strong positive attitude; PA = Positive attitude

3. Barlett' s Test of Sphericity Chi-square = 771.331, df = 10, p = 0.000

Source: created by the author of this study

The 2 Way-MANOVA of the cabin crew members' NTS was used to determine whether there were differences in the 5 NTS components: CandC; TandL; WSSF; PandCR; and ERAC, due to the gender, education, and position variables and the level of work experience. The results shown in Table 3 indicate that position was the only background variable with a significant effect on four of the NTS components: CandC (p = 0.019); WSSF (p = 0.039); PandCR (p = 0.041); and ERAC (p = 0.044), respectively. There was no significant effect on TandL (p = 0.158).

Table 3: Two-Way Multivariate Analysis of Variance

(n=438)

Source		Sum of Squares	df	Mean Square	F	*p*-value	R Square	Adjusted R Square
Corrected Model	CandC	3.817	19	0.201	1.492	0.084	.064	.021
	TandL	4.316	19	0.227	1.161	0.288	050	.007
	WSSF	4.696	19	0.247	1.122	0.325	049	.005
	PandCR	5.399	19	0.284	1.349	0.149	058	.015
	ERAC	7.219	19	0.380	1.000	0.460	.044	.000
Gender	CandC	0.039	1	0.039	.293	0.589		
	TandL	0.124	1	0.124	.635	0.426		
	WSSF	0.280	1	0.280	1.273	0.260		
	PandCR	0.213	1	0.213	1.010	0.315		
	ERAC	0.038	1	0.038	.100	0.752		
Education	CandC	0.294	1	0.294	2.186	0.140		
	TandL	0.086	1	0.086	.441	0.507		
	WSSF	0.318	1	0.318	1.444	0.230		
	PandCR	0.020	1	0.020	0.093	0.761		
	ERAC	0.110	1	0.110	0.290	0.590		
Position	CandC	0.743	1	0.743	5.515	0.019*		
	TandL	0.392	1	0.392	2.001	0.158		
	WSSF	0.942	1	0.942	4.279	0.039*		
	PandCR	0.883	1	0.883	4.189	0.041*		
	ERAC	1.547	1	1.547	4.069	.044*		
Work Experience	CandC	0.104	2	0.052	0.386	0.680		
	TandL	0.005	2	0.003	0.013	0.987		
	WSSF	0.424	2	0.212	0.964	0.382		

Source		Sum of Squares	df	Mean Square	F	*p*-value	R Square	Adjusted R Square
	PandCR	0.002	2	0.001	0.004	0.996		
	ERAC	0.252	2	0.126	0.332	0.718		
Error	CandC	56.015	416	0.135				
	TandL	81.384	416	0.196				
	WSSF	91.601	416	0.220				
	PandCR	87.638	416	0.211				
	ERAC	158.109	416	0.380				
Corrected Total	CandC	59.831	435					
	TandL	85.701	435					
	WSSF	96.297	435					
	PandCR	93.037	435					
	ERAC	165.328	435					

Note: 1. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.822
2. *(***p*** <0.050, ****p*** <0.010, *****p*** <0.000
Source: created by the author of this study

The results reveal that cabin crew members with different demographics in terms of gender, education, position, and work experience exhibit different attitudes towards NTS required as part of their duties. However, only position has a significant impact on four of the five NTS components (CandC, WSSF, PandCR, and ERAC). The other demographic factors have a much more limited impact on a limited number of NTS components. These findings are consistent with the results of previous research on airline cabin services (e.g. Takanen, 2019). This is especially the case with regard to the ranking of positions in the line of duty of cabin crew members. On each flight, the majority of the cabin crew members was junior cabin crew members working under the leadership of their senior cabin crew members, namely Pilot-in-Control, Inflight Supervisor, Chief Purser. While the Pilot-in-Control handled the aircraft, the Inflight Supervisor planned and coordinated resources and implemented the performance management process. As to the Chief Purser, as an immediate supervisor during a flight, he/she took care of workloads and all related matters concerning both common and uncommon situations so as to prevent any problems under his/her control and command (Takanen, 2019).

Still, no matter what lines of duty they hold, both senior and junior cabin crew members must work together as effective teams and maintain status awareness in order to fulfill their tasks and, first and foremost, ensure their passengers' comfort and safety. Thus, all crew members must work up to the point of being able to maintain communication and collaborate with one another so that they can identify their workloads and recognize perceive signs of stress and fatigue, including technical errors that might occur during the flight as a result (Flin et al., 2008). These findings obviously largely reflect various attitudes towards NTS, particularly on the part of both senior and junior cabin crew members as hierarchical positions at both ends of the range play an important role in terms of what has to be done and how it has to be done. Since positions dictate who performs what duty and why, they influence the attitudes of cabin crew member towards NTS.

This can be seen in the consecutive orders of NTS in this study. CandC were perceived as the most prominent, followed by WSSF and PandCR, with ERAC further behind. As part of maintaining situational awareness and attention to the surrounding environment and decision making based on an effective relationship among crew members, ERAC, which as we know, is involved with looking out for error, threats, and undesired aircraft conditions might be overlooked, misinterpreted, or even confused with the technical skills (CASA, 2012). This could well explain all the above findings. Finally, although, insignificant, TandL could be due to a clear-cut ranks and positions perceived as integral parts of the line of duty.

5. Conclusion, Recommendations, and Limitations

Although to date, few research studies have focused on the contribution of NTS to aviation safety in relation to cabin crews, it is nevertheless clear that, as this study shows, their NTS training can significantly improve onboard safety. Incorporating NTS as part of the mandatory training and preparation of cabin crew members to enhance safety on board therefore has become a necessity for every airline. This is in keeping with the ICAO (2014) mandate. Different types of NTS training designed to support the development of the range of knowledge and skills required to deal with safety issues have been proposed. All of them aim to prevent human and technical errors and ensure optimum outcomes for passengers in the provision of cabin service, regardless of the type of airline activities (low-cost or full-service).

It is universally accepted that risk zero does not exist. But, whilst it is well understood that, in spite of all the efforts made to prevent human errors, the risk of an incident caused by a cabin crew member can never be entirely eliminated, every possible step should nevertheless be taken to minimize that risk and if an error occurs, everything possible should be done to mitigate the potential damage arising from it. One way to do this is to ensure that cabin crew members acquire the appropriate NTS to cope with the risks and demands inherent in the performance of their work (Flin et al., 2008; Flin & Maran, 2015; Moriarty, 2015; Carayon et al., 2014; Silva, 2017). Any behavioral skills development and attitude change resulting from NTS training for cabin safety are welcome and should be highly encouraged through the interaction of knowledge, ability, and attitudes (CAA, 2013; Roberson, Shaharyar, & Aneni, 2014).

When applying the suggestions of the ICAO (2014) and CASA (2012, 2019) for NTS training, it is recommended that all five skills be considered together and put into consecutive orders, ranging from the least observed (the weakest) to the most observed (the strongest). For obvious safety reasons, the weakest skills observed should be given priority. Based on the findings of this study, the consecutive order of the skills to be developed would therefore be as followed: (i) ERAC; (ii) PandCR, (iii) WSSF, (iv) CandC, and (v) TandL. The reason for this sequence is that while the weakest skills must be specifically strengthened, the rest of the skills must nonetheless be maintained and possibly enhanced if necessary up to the levels of appropriateness of the safety required. As has been strongly recommended, before embarking on the NTS training of crew members, a training-needs analysis of the levels and orders of significance should be conducted (CASA, 2012).

- *Recommendations and Limitations*

By following the recommendations and guidelines of Aviation Authorities and the conclusions of research studies conducted in the field of aviation safety, it is expected that the findings of the significant levels of NTS in this study will help to integrate the right consecutive orders from the weakest to the strongest skills into the training so as to establish effective human factors and enhance safety and better in-flight services for all the passengers. NTS training conducted as part of enhancing the safety of the work performed by the cabin crews of international airlines in particular should therefore include both the observed skills obtained, from this study and the main categories and elements of NTS provided by researchers and

aviation authorities in the field of NTS for aviation safety (Flin et al., 2003; Flin et al., 2008; CASA, 2012, 2019). EFA, CFA, and SEM were not employed in this study for several reasons. One was the need to explore multiple responses on a single data. The second was that the study aimed to understand outcome variables as a system on a linear combination of measurements so as to explain the attitudes and phenomena of the cabin crews at one point in time of the particular job duration. A third reason was that because of the moderate correlations of the outcome variables found, SEM was not recommended due to high correlations. The results in this study can nevertheless serve as guidelines for assessing the NTS of cabin crews with a view to educating them. Finally, for obvious reasons, this study was limited to one international airline. Future research should therefore, if possible, focus on a different type of airline (full service versus low cost) and/or on an alliance of international commercial airlines from various countries and include more variables and samplings. An exploratory and/or confirmatory factor analysis could also be performed to solidify the identification of NTS constructs and other areas of safety, using cognitive interviews, adverse event report analysis, and cabin crew observations.

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