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## Crew Resource Management (CRM) and Cultural Differences Among Cockpit Crew - the Case of Turkey

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## **Introduction**

Crew Resource Management (CRM) is defined as the effective utilization and management of all resources, including information, equipment and people to achieve safe and efficient flight operations (Driskel & Adams, 1992). Since CRM involves social interactions at its core, it is very dependent on cultural values. Studies have shown that cultural differences among cockpit crew may strongly affect the basic concepts and fundamentals of CRM (Helmreich & Merritt, 1997; Helmreich & Merritt, 1998; Merritt & Helmreich, 1996).

Due to the globalization of the aviation industry, many international airlines recruit cockpit and cabin crews from different countries with different national cultures. For instance, airlines in the United Arab Emirates (UAE) hire hundreds of foreign pilots every year due to the shortage of national pilots. In 2012, only 700 out of 9,480 UAE-registered pilots were UAE nationals (Al-Romaithi, 2014). Similarly, in 2016 there were approximately 6,000 pilots registered in Turkey, 1,200 of which were foreigners (Eksi, 2016). Cultural differences among cockpit crew may create serious operational challenges in a cross-cultural environment and may have serious implications for safety.

## **Literature Review**

### **Culture**

Culture is defined as the values, beliefs and practices that a group shares with others which make them distinct in relation to other groups. It is influenced by the language, education, religion, and customs of the group and it affects the way a person perceives the world. An individual from a particular culture may perceive a particular situation completely different than an individual from another culture (Helmreich, Klinect, & Wilhelm, 1999). The difference in

perception would impact the way individuals approach a problem and solve it (Merritt & Helmreich, 1995).

Within an organization, individuals are subject to the influence of three cultures: the professional cultures of the individuals themselves, the cultures of their organizations, and the national cultures surrounding the individuals and their organizations (Helmreich, Wilhelm, Klinect, & Merritt, 2001).

**International culture.** German Professor Geert Hofstede, who conducted one of the most comprehensive studies on culture, defined culture as “the collective programming of the mind distinguishing the members of one group from others” (Hofstede, 2001, p. 9). In his studies, he focused particularly on the cultural differences arising from nationality and developed a framework to describe the effects of national culture on the values of its members and how these values relate to behavior. His initial analysis identified differences in national cultures on four primary dimensions: Power Distance (PD), Uncertainty Avoidance (UA), Collectivism (COL) and Masculinity (MAS) (Hofstede, 1984).

Hofstede (2001) defined Power Distance (PD) as a measure of interpersonal power, or influence, between the subordinate and superordinate. In high PD cultures, subordinates avoid approaching their superiors directly and hesitate to disagree with them. In such cultures, individuals are mostly unwilling to participate in decision making. In lower PD cultures, on the other hand, consultation is more likely, with subordinates feeling able to question their superiors if, or when, necessary (Mead, 1998).

Uncertainty Avoidance (UA) was defined as the degree to which people in a society feel uncomfortable in unexpected, surprising and unknown situations. In high UA cultures, individuals look for certainty, order and formalized procedures and laws in their daily lives to

decrease the probability of unpredictable future events that may affect their tasks adversely (Adler, 2002; House, Hanges, Javidan, & Dorfman, 2004). On the other hand, cultures with low UA rely less on written rules and are more risk tolerant (Hofstede, 1980).

Collectivism (COL) represents the degree to which individuals are integrated into groups. In high COL cultures, individuals tend to prioritize group benefits over their own interests. In low COL cultures, on the other hand, individuals tend to believe that personal goals and interests are more important than group interests (Hofstede, 1991).

Masculinity (MAS) dimension represents the degree to which people in a society stress achievement or nurture. High MAS cultures emphasize ambition, acquisition of wealth, and differentiated gender roles. On the opposite side, low MAS cultures stress caring and nurturing behaviors, sexual equality, environmental awareness, and more fluid gender roles (Hofstede, 1991).

**Sub-culture - organizational culture and professional culture.** Organizational culture is defined as a system of shared assumptions, values, and beliefs, which govern how people behave in organizations. It differentiates the characteristics and value systems of different organizations. Professional culture, on the other hand, differentiates the characteristics of particular professional groups (i.e. the characteristic behavior of pilots versus that of air traffic controllers). Individuals from same profession tend to adopt the value system and develop behavior patterns consistent with their peers or predecessors and create a professional culture (International Civil Aviation Organization [ICAO], 2013).

### **Crew Resource Management (CRM)**

During the 1970s, a significant number of human factors contributed to a series of aircraft disasters, which led NASA and the National Transportation Safety Board (NTSB) in the United

States to investigate the behavioral interactions between pilots as causes of accidents. The major problems confronted by flight crews in these accidents were associated with poor group decision-making, ineffective communication, lack of situation awareness, and the failure to make use of readily available resources (Helmreich & Foushee, 1993). These problems were related to non-technical skills, or, in other words, “cognitive and social skills” of flight crew (Flin, Martin, Goeters, Hoermann, Amalberti, Valot, & Nijhuis, 2003).

In the aviation industry, the term “non-technical skills” was first expressed as “Crew Resource Management (CRM) skills” by European Joint Aviation Authority (JAA) (Kanki, Helmreich, & Anca, 2010). CRM was defined as the effective utilization and management of all resources including information, equipment and people to achieve safe and efficient flight operations (Lauber, 1984).

**CRM trainings.** Since the 1980s, various CRM training programs have been developed in the United States and around the world. These trainings were the practical application of human factors targeting pilots' skills and abilities related to the non-technical aspects of flight, such as interpersonal communication, situational awareness, leadership, assertiveness, decision making and teamwork (O'Connor, Flin, & Fletcher, 2002; Kanki & Smith, 2001).

CRM trainings stress the impact on internal influences (e.g., speaking, listening and decision-making skills, conflict resolution techniques, and the use of appropriate assertiveness and advocacy) and external influences (e.g. rank, age, gender, and organizational culture) on interpersonal communications. The crew is trained on using effective techniques for resolving disagreements among crewmembers and advocating the course of action that they feel is best, even though it may involve conflict with others. Maintaining a proper balance between respecting authority and practicing assertiveness as well as maintaining a friendly, relaxed, and

supportive, yet task-oriented, tone in the cockpit are emphasized in these trainings. In addition, the crew is trained on effective leadership techniques and sensitivity to other crewmembers' personalities and styles (Federal Aviation Administration [FAA], 2004).

**Assessing CRM attitude.** In the early 1980s, safety related attitudes of commercial aviation pilots were assessed by using the Cockpit Management Attitudes Questionnaire (CMAQ) (Helmreich, 1984). The questionnaire intended to measure attitudes towards non-technical skills such as communication, stress recognition, organizational hierarchies, organizational climate and work values (Helmreich & Merritt, 1998). Assessing pilots' attitude towards using CRM skills was found to be crucial for safe flight operations, since attitudes may play an important role in whether or not an individual intends to engage in proper CRM behaviors (Goeters, 2000; Grubb, Crossland, & Katz, 2002; O'Connor et al., 2002; Grubb & Morey, 2003; Salas, Wilson, Burke, Wightman, & Howse, 2006).

A broadened version of this questionnaire was then developed and named "Flight Management Attitude Questionnaire (FMAQ)" (Merritt, Helmreich, Wilhelm, & Sherman, 1996). That latest version contained additional items for measuring cross-cultural aspects of flight management attitudes based on Hofstede's four dimensions of national culture (Helmreich & Merritt, 1998). Since then, FMAQ, and its variants, have been the most commonly used measure of flight safety and CRM attitudes within the aviation industry.

**CRM and cultural differences in the cockpit.** Since CRM involves social interactions at its core, it is very dependent on cultural values. In her study, Merritt (1993) demonstrated that the national culture strongly affects the level and nature of communications and social interaction among flight crews. In addition, many studies have demonstrated that cultural differences among crew members may invalidate the basic concepts and fundamentals of CRM

(Helmreich & Merritt, 1997; Helmreich & Merritt, 1998; Merritt & Helmreich, 1996). Al-Romaihi (2014) found that certain cultural traits and beliefs influence pilots' behavior and attitudes which may jeopardize safety and that CRM skills may be weakened as a result of heterogeneous nationality combinations. Moreover, in their study conducted to more than 15,000 pilots from 22 nations, Helmreich et al. (2001) found differences in PD scores of pilots which may affect a pilots' CRM skills. They found that in Morocco, the Philippines, Taiwan, Japan and Brazil, which had the highest PD scores among all countries, it was very unlikely for co-pilots to question the captain's decisions and actions or in any way dispute his authority. On the other hand, in countries including Ireland, Denmark, Norway and the United States, which had low PD scores, pilots accepted a consultative leadership style, and they were more willing to question senior crew members' decisions.

There may also be sub-cultural differences among pilots due to the differences in their training background, age and expertise (Sekerli & Gerede, 2011). For instance, pilots coming from the Army and Navy receive their initial flight trainings from military organizations and civilian pilots receive their flight training from civilian Flight Training Organizations (FTOs). Military organizations have a very hierarchical structure with a formal line of authority where subordinates follow and obey the orders given by superiors without questioning them. The structure of civilian FTOs, on the other hand, may be less hierarchical and less formal. Consequently, there may be sub-cultural differences between military and civilian pilots. Similarly, there may be sub-cultural differences among pilots from different age groups and with different experience levels. These sub-cultural differences among pilots may result in differences in pilots' attitudes towards using CRM skills. This area, however, has not been explored yet and needs further research.

## **Language Diversity in the Cockpit**

Communication between people from different national cultures may be impaired by language differences, which may have serious implications for safety in the case of cockpit crew (Helmreich, 1999). Eventually people from different backgrounds work together by communicating in a language that most probably is not their native one, resulting in language and communication barriers among the crew (Metscher, Smith, & Alghamdi, 2009). Language diversity may create operational challenges in a cross-cultural environment and may create a number of disadvantages, such as mental exhaustion, second-language speakers to pretend understanding first-language speakers to avoid embarrassment, and first-language speakers to slow down their rate of speech and simplify their sentences while speaking with second-language speakers (Thomas, 2008). Ineffective communication due to language barriers may also lead to poor situational awareness and lower confidence levels among crew members (Lichacz, 2008). Many researchers have explored the way a pilot's performance is closely associated with the quality of interactive communication in the cockpit (Sexton & Helmreich, 2000; Gladwell, 2008; Ruffell-Smith, 1979). In his study, Cheng (2014) investigated communication difficulties experienced by international captains during their interactions with Chinese co-pilots in the cockpit due to language differences.

## **Attitude Toward Foreigners**

In a cross-cultural environment, pilots may have difficulty in working with pilots from different cultures. In addition, language diversity in the cockpit, and the disadvantages it may bring, can result in discomfort among pilots who speak English as a second language. These difficulties may result in negative attitudes toward working with foreign crew members. Moreover, a pilot's level of nationalism may affect his/her attitude toward working with foreign

cockpit crew. Having a negative attitude toward foreign cockpit members may have serious implications for safety as attitudes may have a powerful influence over a person's behavior. This area however is still unexplored and needs further research.

**Customized CRM training.** No culture can be generalized as good or bad in terms of human error or safety and each culture may have both positive and negative influence on the task being performed and on group functioning (Helmreich et al., 2001). It is, however, important for airlines to be aware of the cultural differences among cockpit crew and train them to prevent the negative impacts of cultural differences on safety and to support the positive impacts of these differences with other CRM skills (Merritt, 1993). This is especially critical for airlines with multi-cultural crew (Merritt, 2000).

For instance, pilots coming from high UA cultures, may be better in following Standard Operating Procedures (SOP) which provide flight crew with a guide to effectively and safely carry out operations (Kanki et al., 2010). However, those high on UA may be less creative in coping with novel situations. Therefore, pilots from high UA cultures may need to be supported with other CRM skills such as situational awareness, flexibility, and adaptability to be able to cope with new and exceptional situations.

Similarly, for pilots from high PD cultures, CRM trainings may focus on appropriate communication techniques where co-pilots are encouraged to question captains if they observed them making mistakes (MacDonald, 2012).

Attitudes can change over time and changing attitudes is one of the goals of CRM. Reducing the likelihood of error, stopping errors before they have a negative effect on operation, and alleviating the consequences of error are the aimed outcomes of CRM (Helmreich & Merritt, 1996). These outcomes could only be achieved with effective customized CRM trainings.

## Methodology

In order to reach the study's aims, a structured questionnaire was developed. An early draft of the survey instrument was reviewed by a group of academicians with expertise in the subject area. The questionnaire was then pilot tested before being conducted. The survey was administered in March 2016 via an online tool "SurveyMonkey." The link of the survey was shared randomly with Turkish and foreign pilots flying in Turkish airline companies, including Turkish Airlines, Pegasus Airlines, AtlasGlobal, Onur Air, SunExpress and Anadolujet via LinkedIn, a business- and employment-oriented social networking service. The participants were informed that their responses would be treated confidentially, in order to reduce the presence of response distortion. A reminder was sent to those who had failed to respond to the survey after a week. As a result, 375 responses were achieved corresponding to a response rate of 53%. In 2016 there were 4,585 pilots working for THY, the largest airline company in Turkey (Artan, 2017). The total number of passenger airline pilots registered in Turkey was not more than 6,000. With a 5% margin of error and 95% confidence interval, a sample size of 375 was well representing the sample size.

The questionnaire was divided into three parts. The first part of the survey aimed to investigate the cultural differences among Turkish and foreign pilots flying in Turkey. In this part, 20 questions developed by Yoo, Donthu, and Lenartowicz (2011) were used for measuring Hofstede's (1984) four dimensions of cultural values: PD, UA, COL and MAS. The second part of the survey assessed Crew Resource Management (CRM) perception of respondents. Questions in this part were adopted from "Flight Management Attitudes Questionnaire (FMAQ)" (Merritt et al., 1996). Together with CRM experts, questions related to language differences in the cockpit and to the pilots' perception toward flying in a multinational cockpit were added.

For all the questions, respondents were asked to rate how much they agree with each statement on a five-point scale (*Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree*). The measures included in the survey can be found on Appendix A. The third part of the survey collected information about respondents' demographic data, such as age and gender and profession-related data, such as flight experience, education background, and title.

### **Hypothesis Testing**

The hypotheses aimed to be tested with this study are as follows:

Hypothesis 1: There are significant cultural differences among Turkish and foreign pilots.

Hypothesis 2: There are sub-cultural differences between captains and F/Os.

Hypothesis 3: There are sub-cultural differences between military and civilian pilots.

Hypothesis 4: There are differences in CRM perception of Turkish and foreign pilots.

Hypothesis 5: There are differences in CRM perception of captains and F/Os.

Hypothesis 6: There are differences in CRM perception of military and civilian pilots.

Hypothesis 7: There are differences in the attitudes of Turkish and foreign pilots toward a multinational cockpit.

Hypothesis 8: There are differences in the attitudes of captains and F/Os toward a multinational cockpit.

Hypothesis 9: There are differences in the attitudes of military and civilian pilots toward a multinational cockpit.

### **Results**

The sample consisted of 375 pilots including 190 First Officers (F/Os) and 185 Captains flying for one of the scheduled airlines in Turkey. Seventy-seven percent of the respondents

were Turkish and 23% were foreign pilots (Table 1). Foreign pilots included in this survey were all from European countries including France, Italy, Greece, Germany, and UK.

Table 1

*Distribution of Sample by Nationality and Title*

Nationality	Captain	F/O	%
Turkish	137	153	77.3
Foreign	48	37	22.7
Total (N=375)	185	190	

Forty-five percent of the respondents had a military background, most of whom were from the Army and Navy, and 55% had civilian background and received their flight training from civilian Flight Training Organizations (FTOs). The pilots from military organizations will be referred to as “military pilots,” and pilots from civilian FTOs will be referred as “civilian pilots” throughout the analysis.

### **Assessing Cultural Differences (Hypotheses 1, 2, and 3)**

A confirmatory factor analysis was conducted for Hofstede’s (1984) “Cultural Dimensions Survey.” The Kaiser-Meyer-Olkin (KMO) values indicated that the sample size for the factor analysis was adequate (KMO: 0.805, Chi-square: 2614.3, df 136). Bartlett test results indicated that relations between variables under each factor were sufficient at a significant level ( $p = 0.00 < 0.05$ ). All items of the questionnaire were loaded under 4 factors as the theory suggests. Cronbach’s alpha reliability of each factor was found to be greater than 0.70 which indicated that all factors were reliable (Table 2).

“Independent sample t-tests” were conducted to see whether there were significant differences in the four cultural dimensions between Turkish and foreign pilots, between F/Os and captains, and between military and civilian pilots. In three of the cases, there were only two groups to compare the means; therefore “independent sample t-test” was found to be the most appropriate analysis. The independent t-test requires that the dependent variable is normally distributed within each group. Based on the Central Limit Theorem, as long as each sample is based on 30 or more observations, the sampling distribution of the mean can be safely assumed to be normal. There were more than 30 samples in each sample being compared, so the Central Limit Theorem applied for this analysis.

Table 2

*Results of Factor and Reliability Analysis for Cultural Dimensions Survey*

Factors	Cronbach’s Alpha
Factor 1: Power Distance	.746
Factor 2: Uncertainty Avoidance	.898
Factor 3: Collectivism	.821
Factor 4: Masculinity	.742

KMO sample adequacy: 0.805, Chi-square: 2614.3, df 136, p-value: 0.000

**Power distance.** The results indicated that Turkish pilots had significantly higher scores ( $M = 2.05$ ,  $SD = 0.76$ ) on PD than foreign pilots ( $M = 1.6$ ,  $SD = 0.43$ ) conditions;  $t(249.9) = 6.57$ ,  $p = 0.000$  (Table 3). Higher scores indicated higher PD values and acceptance of a more autocratic type of leadership.

Table 3

*Mean Comparison Power Distance vs. Nationality*

Nationality	N	Mean	Std. Deviation
T.C.	290	2.0517	.76295
Other	85	1.6275	.42852

Moreover, the results indicated that military pilots had significantly higher scores (M = 2.13, SD = 0.79) on PD than civilian pilots (M = 1.81, SD = 0.62) conditions;  $t(317.4) = 4.29$ ,  $p = 0.000$  (Table 4).

Table 4

*Mean Comparison Power Distance vs. Training Background*

Training	N	Mean	Std. Deviation
Military	170	2.1314	.79388
Civilian	205	1.8098	.62371

These two findings were supported by the comments of some Turkish and foreign F/Os who stated that they usually feel more anxious flying with military captains due to their high PD values. As stated previously, military organizations have very hierarchical structure and pilots from the Army or Navy might be willing to experience the same structure in the cockpit, which may result in them being more power-distanced.

Table 5

*Mean Comparison Power Distance vs. Title*

Title	N	Mean	Std. Deviation
Captain	185	2.0396	.73367
F/O	190	1.8737	.70470

Captains had significantly higher scores ( $M = 2.03$ ,  $SD = 0.73$ ) on PD than F/Os ( $M = 1.87$ ,  $SD = 0.70$ ) conditions;  $t(373) = 2.23$ ,  $p = 0.026$  (Table 5). The foreign captains' mean PD score was even lower than that of Turkish captains (Table 6). Some of the Turkish F/Os stated in their individual comments that they felt less stressful while they were flying with foreign captains than with Turkish captains. This may be due to higher PD values of Turkish captains compared to foreign captains.

Table 6

*Mean Comparison Power Distance vs. Nationality and Title*

Nationality / Title	Captain		First Officer	
	T.C.	Other	T.C.	Other
Power Distance	2.15	1.73	1.97	1.50

**Uncertainty avoidance (UA).** The results revealed that Turkish pilots had significantly higher UA scores ( $M = 4.62$ ,  $SD = 0.58$ ) than foreign pilots ( $M = 4.22$ ,  $SD = 0.44$ ) conditions;  $t(373) = 5.87$ ,  $p = 0.000$  (Table 7).

Table 7

*Mean Comparison Uncertainty Avoidance vs. Nationality*

Nationality	N	Mean	Std. Deviation
T.C.	290	4.6186	.58119
Other	85	4.2188	.43820

The results also indicated that military pilots had significantly higher scores ( $M = 4.62$ ,  $SD = 0.55$ ) on UA than civilian pilots ( $M = 4.45$ ,  $SD = 0.58$ ) conditions;  $t(373) = 2.80$ ,  $p = 0.005$  (Table 8). As stated previously, military pilots are trained with completely different purposes than civilian pilots. They are thought to have no tolerance for any ambiguity. This may be an important reason why UA scores of military pilots are higher compared to civilian pilots.

Table 8

*Mean Comparison Uncertainty Avoidance vs. Training Background*

Training Background	N	Mean	Std. Deviation
Military	170	4.6188	.55547
Civilian	205	4.4527	.58272

**Collectivism (COL).** The analysis revealed that there was no difference between the COL scores of Turkish and foreign pilots ( $p\text{-value} > 0.05$ ).

**Masculinity (MAS).** The analysis also revealed that there was no difference between the MAS scores of Turkish and foreign pilots ( $p\text{-value} > 0.05$ ).

### Assessing CRM Perception (Hypothesis 4, 5, and 6)

“Independent sample t-tests” were conducted to see whether there were significant differences between CRM perceptions of Turkish and foreign pilots, of F/Os and captains, and of military and civilian pilots. In addition, ANOVA tests were conducted to see whether there were significant differences in CRM perception of pilots from different age groups.

**CRM statement 1 – “First Officer (F/O) should not question the actions of the captain except when they threaten the safety of the flight.”** High mean scores for this statement reflected the acceptance of unequal power relationships by subordinates. The independent sample t-test results revealed that Turkish pilots were more likely to agree ( $M = 2.7$ ,  $SD = 1.15$ ) with this statement than foreign pilots ( $M = 1.8$ ,  $SD = 0.76$ ) conditions;  $t(208) = 7.73$ ,  $p = 0.000$  (Table 9). This was highly parallel with the higher PD values of Turkish pilots compared to foreign pilots.

Table 9

*Results of t-test and Descriptive Statistics for CRM Statements and Attitude Toward Multinational Cockpit by Nationality*

	Nationality						t	df
	Turkish			Foreign				
	M	SD	n	M	SD	n		
CRM1	2.7103	1.15819	290	1.8824	.76239	85	7.73*	208
CRM2	4.1655	.84028	290	3.1647	1.01003	85	8.33*	120
CRM3	3.1138	1.16055	290	3.5529	1.01777	85	3.38*	154
CRM5	3.1276	1.16506	290	3.7882	1.09211	85	4.38*	145
Attitude Toward Multinational Cockpit	3.5655	.83760	290	3.7353	.54466	85	2.21*	211

\*  $p < .05$

Moreover, the results revealed that military pilots were more likely to agree ( $M = 2.69$ ,  $SD = 1.09$ ) with this statement than civilian pilots ( $M = 2.38$ ,  $SD = 1.15$ ) conditions;  $t(373) = 2.68$ ,  $p = 0.008$ . This was again in parallel with the higher PD scores of military pilots compared to civilian pilots (Table 10).

**CRM statement 2 – “The airline’s rules should not be broken even if the cockpit crew thinks it is in the airline’s best interest.”** This statement may be related to the UA dimension of culture. The independent sample t-test results revealed that Turkish pilots were more likely to agree ( $M = 4.16$ ,  $SD = 0.84$ ) with this statement than foreign pilots ( $M = 3.16$ ,  $SD = 1.01$ ) conditions;  $t(120) = 8.33$ ,  $p = 0.000$  (Table 9). This result was in parallel with the higher UA score of Turkish pilots compared to that of foreign pilots.

Moreover, military pilots were much more likely to agree ( $M = 4.14$ ,  $SD = 0.87$ ) with this statement than civilian pilots ( $M = 3.77$ ,  $SD = 1.02$ ) conditions;  $t(373) = 3.78$ ,  $p = 0.000$  (Table 10). The training that military pilots receive may cause them to be over-reliant on rules and procedures.

Table 10

*Results of t-test and Descriptive Statistics for CRM Statements by Training Background*

	Training Background						t	df
	Military			Civilian				
	M	SD	n	M	SD	n		
CRM1	2.6941	1.09354	170	2.3805	1.15113	205	2.68	373
CRM2	4.1412	.87236	170	3.7707	1.02475	205	3.78	373
CRM3	3.0353	1.10884	170	3.3610	1.15319	205	2.77	373
CRM4	2.8706	1.29896	170	3.1707	1.22679	205	2.30	373

\*  $p < .05$

**CRM statement 3 – “Written procedures are necessary for all in-flight situations.”**

This statement may also be related to UA dimension of culture and the independent sample t-test results revealed that foreign pilots were much more likely to agree ( $M = 3.55$ ,  $SD = 1.01$ ) with this statement than Turkish pilots ( $M = 3.11$ ,  $SD = 1.16$ ) conditions;  $t(153.7) = 3.38$ ,  $p = 0.001$  (Table 9).

Moreover, the results revealed that civilian pilots were much more likely to agree ( $M = 3.36$ ,  $SD = 1.15$ ) with this statement than military pilots ( $M = 3.03$ ,  $SD = 1.10$ ) conditions;  $t(373) = 2.770$ ,  $p = 0.006$  (Table 10).

Although UA score of Turkish pilots was significantly higher than that of foreign pilots, for this statement, the result was just the opposite. Similarly, although UA scores of military pilots were significantly higher than that of civilian pilots, the result was exactly the opposite for this statement.

**CRM statement 4 – “The pilot I am flying with directly affects my flight performance.”** The independent sample t-test results revealed that F/Os were much more likely to agree ( $M = 3.46$ ,  $SD = 1.21$ ) with this statement than captains ( $M = 2.59$ ,  $SD = 1.17$ ) conditions;  $t(373) = 7.06$ ,  $p = 0.0001$  (Table 11). The captain has the final authority and responsibility for the operation and safety of the flight. Therefore, as the subordinate in the cockpit, the superordinate they are flying with might be a bigger issue for F/Os. The comment of a Turkish F/O supported this finding where he stated: *“The presence of flight team is determined by the professionalism and attitude of the captain. CRM can easily be undermined by the captain.”*

Moreover, civilian pilots were more likely to agree ( $M = 3.17$ ,  $SD = 1.22$ ) with this statement compared to military pilots ( $M = 2.87$ ,  $SD = 1.29$ ) conditions;  $t(373) = 2.30$ ,  $p = 0.022$

(Table 10). The comment of a foreign F/O might provide an insight into this finding: “*There isn't much of a difference between working with foreigners and Turkish civilian pilots, but the main issue is working with pilots with a military background. They generally have a poor understanding of CRM, and this is something I haven't seen as a problem when operating with ex-military pilots in other countries.*”

Table 11

*Results of t-test and Descriptive Statistics for CRM Statements and Attitude Toward Multinational Cockpit by Title*

	Title						t	df
	Captain			F/O				
	M	SD	n	M	SD	n		
CRM4	2.5946	1.17629	185	3.4632	1.20678	190	7.06	373
CRM5	3.4972	1.10887	185	3.0631	1.21115	190	3.62	372
Attitude Toward Multinational Cockpit	3.5135	.83760	185	3.6921	.54466	190	2.22	373

\*  $p < .05$

The ANOVA test results revealed that there were significant differences in CRM4 scores of pilots from different age groups at the  $p < .05$  level [ $F(3, 371) = 9.50, p = 0.000$ ] (Table 12).

Table 12

*Results of ANOVA and Descriptive Statistics for CRM Statement 4 by Age Group*

Source	df	SS	MS	F	p
Between groups	3	42.850	14.283	9.502	.000
Within groups	371	557.699	1.503		
Total	374	600.549			

Post hoc comparisons using the Tukey HSD test indicated that, as the age of the pilots increased, they were less likely to agree with this statement (Appendix B). This was in parallel with the finding above which indicated that F/Os were much more likely to agree with this statement than captains as F/Os in most cases are younger compared to captains.

**CRM statement 5 – “Language differences between cockpit crews from different countries may cause a threat to safety.”** The results revealed that foreign pilots were more likely to agree ( $M = 3.13$ ,  $SD = 1.16$ ) with this statement than Turkish pilots ( $M = 3.79$ ,  $SD = 1.09$ ) conditions;  $t(145) = 4.83$ ,  $p = 0.000$  (Table 9). Some of the following comments of foreign pilots may give an insight into this result:

*“In my experience of three years in Turkey I have experienced challenges in communication especially with Turkish captains as most of the time they are unable to converse in proper English.”*

*“As English is the language of aviation the level of English of the crew should be questioned. This is not only limited to the cockpit crew but is also very important with regards to Air Traffic Controller (ATC) communication or ground staff communication.”*

*“I have seen many examples where the cockpit crew was unable to understand ATC communications. In my opinion the focus should not be on whether someone is foreigner or local, but if someone speaks English or not.”*

*“I know many Turkish pilots who are saying that flying with a foreigner is not safe because we don't speak Turkish; however, English is the worldwide language of aviation and ATC and other aviation personnel outside Turkey also doesn't speak Turkish!”*

*“I think that English is the worldwide language in aviation and should be a crucial factor in training. We have to get a certain level of proficiency in English for our work. This is easy to*

*get for most people, but the biggest problem is conversational ability in English which is often absent.”*

*“I have a few hesitations regarding the English level of not only pilots, but also ATC and cabin crew personnel. In Turkey, I see the danger of foreign cockpit staff being left out of the Turkish conversation between pilot, cabin crew and even ATC especially in case of an emergency.”*

*“From my experience, as a foreigner flying in Turkey, I can say that especially in the eastern airports of Turkey there are some challenges communicating with airport personnel i.e. ATC, ramp agents, and handlers. During normal operations, the complications are non-existent or can easily be handled, but in case of an emergency or non-normal situation this can cause some problems. I think this is an important subject looking at the future growth of the (international) aviation in Turkey.”*

Moreover, the independent sample t-test results revealed that captains were much more likely to agree ( $M = 3.49$ ,  $SD = 1.11$ ) with this statement than F/Os ( $M = 3.06$ ,  $SD = 1.21$ ) conditions;  $t(372) = 3.62$ ,  $p = 0.0000$  (Table 11).

The ANOVA test results revealed that there were significant differences in CRM5 scores of pilots from different age groups at the  $p < .05$  level [ $F(3, 371) = 6.92$ ,  $p = 0.000$ ] (Table 13). Post hoc comparisons using the Tukey HSD test indicated that, as the age of the pilots increased, they were more likely to agree with this statement (Appendix B). This was parallel to the finding above, which indicated that captains were much more likely to agree with this statement than F/Os as captains in most cases are older compared to FOs.

Table 13

*Results of ANOVA and Descriptive Statistics for CRM Statement 5 by Age Group*

Source	df	SS	MS	F	p
Between groups	3	27.627	9.209	6.923	.000
Within groups	371	493.530	1.330		
Total	374	521.157			

**Assessing Attitudes towards Flying in a Multinational Cockpit (Hypothesis 7, 8, and 9)**

An exploratory factor analysis was conducted for questions assessing pilots' attitude towards flying in a multinational cockpit.

Table 14

*Results of Factor and Reliability Analysis for "Attitude Towards a Multinational Cockpit" Questions*

Factors	Cronbach's Alpha
Factor 1: Attitudes towards a Multinational Cockpit	.761

KMO sample adequacy: 0.738, Chi-square: 416.171, df 6, p-value: 0.000

The Kaiser-Meyer-Olkin (KMO) values indicated that the sample size for the factor analysis was adequate (KMO: 0.738, Chi square 416.171, df 6). Bartlett test results indicated that relations between variables under each factor were sufficient at a significant level ( $p = 0.00 < 0.05$ ). All items of the questionnaire were loaded under a single factor which was named "Attitude towards a multinational cockpit." Cronbach's Alpha reliability of the factor was found to be 0.761 which indicated that the factor was highly reliable (Table 14). The

statements included in the analysis and their loadings can be found on Table 15, and the results of anti-image correlation matrices can be found in Appendix C.

Table 15

*Factor Analysis Component Matrix Results for “Attitude Towards a Multinational Cockpit” Questions*

	Component 1
Statement 1 - I am confident that cockpit crew members from different countries in a cockpit would react coordinately and effectively in an emergency situation	.813
Statement 2 - I don't mind flying with a Turkish or a foreign pilot	.786
Statement 3 - There is less cohesiveness among cockpit crews from different countries	-.764
Statement 4 - I prefer flying with a pilot from my own country than flying with a foreign one	-.744

“Independent sample t-tests” were conducted to see whether there were significant differences in “attitude towards a multinational cockpit” between Turkish and foreign pilots, between F/Os and captains, and between military and civilian pilots. The results revealed that foreign pilots had significantly higher scores ( $M = 3.73$ ,  $SD = 0.54$ ) than Turkish pilots ( $M = 3.56$ ,  $SD = 0.84$ ) conditions;  $t(211) = 2.21$ ,  $p = 0.028$  (Table 9). Higher scores indicated a more positive attitude toward flying in a multinational cockpit.

Foreign pilots may have a more positive attitude toward flying in a multinational cockpit because of two reasons: First, the foreign pilots responding to this questionnaire were flying for a Turkish company; in other words, they already had experience in a multinational cockpit. Second, the foreign respondents were all Europeans. The European Union (EU) encourages all its citizens to be multilingual. The most widely spoken language in the EU is English, which is understood by 51% of all adults. Moreover, citizens of the EU can freely move and reside within

the territory of the EU, where different languages are being spoken. Therefore, the main language “English” might be less of a problem for European citizens compared to Turkish citizens.

The lower scores of Turkish pilots towards a multinational cockpit may be language related. One Turkish Captain stated in his comment: *“Although the common language of aviation is English, there are emergency instances where you don’t have time to think of the right English words and lack of communication in such instances may result in fatal accidents or incidents.”* He gave the example of German flag carrier Lufthansa, which hired only German pilots or pilots who speak German fluently as a second language. Another Captain made a similar comment stating: *“I don’t think two pilots who barely understand each other under normal circumstances, would be able to command cockpit and cabin in an emergency situation.”* These sentences imply that language differences may be an important reason for a negative attitude toward a multinational cockpit.

Another reason for lower scores of Turkish pilots towards a multinational cockpit may be due to their nationalistic approach. One Turkish captain indicated in his comment: *“European countries such as Greece, Germany, and Italy never hire pilots from Turkey or ask too many requirements from Turkish pilots such as visa, work and residence permits which are almost impossible to receive. On the opposite side, there have been many foreign pilots flying for a Turkish carrier in Turkey.”* Another Turkish Captain stated in his comment: *“In Turkey there is a positive discrimination in favor of European pilots assuming that they always have better flight training in Europe. This is totally wrong. Some of these pilots come to Turkey because they are not qualified enough to find a job in their countries. Besides that, I don’t think that most of these*

*pilots' English level is good enough. Most of the time it is difficult to communicate with them in English."*

Many other Turkish pilots made very similar comments about the foreign pilots flying for Turkish airlines. They were not against flying with foreigners, but they believed that Turkish pilots should be given priority in hiring and promotion processes. These sentences suggest that nationalism might be an important reason for a negative attitude toward a multinational cockpit.

Moreover, the results also revealed that F/Os had significantly higher scores ( $M = 3.69$ ,  $SD = 0.54$ ) than captains ( $M = 3.51$ ,  $SD = 0.84$ ) conditions;  $t(373) = 2.22$ ,  $p = 0.027$  (Table 11). This result indicated that F/Os had more positive attitude toward flying with a foreign pilot than the captains. One Turkish F/O stated in his comment that foreign pilots improve CRM by sharing their international experiences with Turkish pilots and by helping them to improve communication skills and to overcome the cultural barriers. Moreover, another Turkish F/O stated in his comment: *"Most of the time, if I know that I'll be flying with a foreign captain, I go to that flight more peacefully, but if I am going to fly with a Turkish captain, I feel more stressed since I can't estimate what type of attitude I'll be facing with. Turkish captains behave capriciously and are mostly low-tolerant."* On the other hand, Turkish captains were more likely to prefer flying with pilots from their own country rather than flying with foreigners.

The ANOVA test results revealed that there were significant differences in "Attitude Toward Multinational Cockpit" scores of pilots from different age groups at the  $p < .05$  level [ $F(3, 371) = 3.60$ ,  $p = 0.014$ ] (Table 16). Post hoc comparisons using the Tukey HSD test indicated that as the age of the pilots increased they had less positive attitude toward flying in a multinational culture (Appendix B). This was in parallel with the finding above, which indicated

that F/Os had more positive attitude toward flying with foreign pilots than the captains as in most cases are older than F/Os.

Table 16

*Results of ANOVA and Descriptive Statistics for “Attitude Towards a Multinational Cockpit” by Age Group*

Source	df	SS	MS	F	p
Between groups	3	6.009	2.003	3.605	.014
Within groups	371	206.141	.556		
Total	374	212.150			

### **Discussions and Managerial Implications**

Cultural differences among cockpit crew members may result in substantial differences in pilots’ attitudes towards using CRM skills. In this study, significant differences in PD and UA dimensions of culture were found between Turkish and foreign pilots, between F/Os and captains, and between military and civilian pilots. Especially differences in PD and UA values among pilots should be addressed as these are the two important cultural dimensions which may strongly influence CRM attitudes. In this regard, this study supported Sekerli and Gerede’s (2011) findings. They also found that Turkish pilots had very high PD and UA scores and suggested that customized trainings addressing these differences should be provided to the cockpit crew to prevent having negative impacts on safety.

The degree that a pilot’s performance is affected by the person he/she is flying with was another important finding of this study. It was found that F/Os and civilian pilots were more likely to be affected by the person they are flying with than captains and military pilots respectively. In aircraft operations, pilots must adhere to Standard Operating Procedures (SOP),

which provide flight crew with a guide to effectively and safely carry out operations regardless of the person they are flying with. Airlines should address this issue and train their crew to ensure that crew members who have never flown together before, come together by knowing exactly what to expect from each other.

Another important finding of the study was related to the language differences among cockpit crew. Foreign pilots were more likely to agree that language differences between cockpit crews from different countries may cause a threat to safety than Turkish pilots and captains were much likely to agree with it than F/Os. Most importantly, individual comments of the pilots revealed that language diversity may create serious operational challenges in a cross-cultural environment. Moreover, the comments of the pilots revealed that language differences create communication challenges not only between foreign and Turkish pilots but also between foreign pilots and Turkish cabin crew, air traffic controllers, ramp agents, and ground handlers. These findings need to be addressed by the airlines. Language training and most importantly practice should be intensified for the non-native speakers of English.

Furthermore, the findings revealed that Turkish pilots and captains had more negative attitudes toward flying in a multinational cockpit than foreign pilots and F/Os respectively. These findings may have serious implications for safety as a person's attitude may have a powerful influence over a person's behavior. The individual comments of pilots revealed the significance of this issue. Different attitudes toward a multinational cockpit should be addressed by airlines to be able to minimize their potential negative impacts on flight safety.

The aviation industry is getting globalized, and flight crew from different cultures end up flying in the same cockpit. This is expected to continue in the future. The primary goal of CRM is to reduce crew errors by improving interpersonal communications and by promoting a

healthier working relationship. Since CRM involves the social interactions at its core, it is very dependent on cultural values. As Helmreich et al. (2001) stated, no culture can be generalized as good or bad in terms of human error or safety. However, it is important for airlines to have a full understanding of cultural influences on their operations. They should then provide necessary trainings to their crew to minimize the negative aspects of cultures on safety and to support the positive aspects with other CRM skills. CRM trainings should be congruent with the culture, which would help crew members from different national culture and subcultures to view a given situation with similar levels of understanding. Appropriate communication techniques must be taught to cockpit crew to guide them on how to react in the case of a culture clash in the cockpit.

Attitudes can change over time, and changing attitudes is one of the goals of CRM. Pilots' CRM attitudes and their attitudes toward foreigners should be assessed and addressed with necessary trainings. Reducing the likelihood of error, preventing errors before they have an operation effect, and mitigating the consequences of error are the aimed outcomes of CRM (Helmreich & Merritt, 1996). These outcomes could only be achieved with effective CRM trainings.

### **Limitations of the Study and Recommendation for Further Research**

This study was limited to the Turkish aviation market only; also, the sample size of this study was limited to pilots using LinkedIn accounts. A more comprehensive study focusing on other airlines in different parts of the world with multicultural crew may be conducted. In addition, this study only focused on the pilots. It would be valuable to conduct similar studies on flight attendants, ATC, and aircraft maintenance personnel.

Moreover, more studies are needed to investigate the impact of cultural differences among pilots about their attitudes regarding CRM skills. Future research may also be conducted

to investigate why and how the performance of the pilots can be affected by the person they fly with. Furthermore, negative attitudes of pilots towards a multicultural cockpit, and its possible impact on teamwork and communication among groups, is still unexplored and needs further research. Finally, although the data in this research gave insights into the language differences issues between cockpit crew from different countries, the result is still inconclusive and requires further research. Further studies may focus on the language differences among pilots and its possible impact on flight safety.

### **Conclusions**

The aim of this research was to take Turkish airlines' attention to the cultural and sub-cultural differences among pilots flying in the Turkish aviation industry and their potential impact on CRM attitude of pilots. Moreover, it aimed to reveal the differences in CRM perception of pilots and their attitude toward flying in a multinational cockpit.

The findings revealed that there were significant cultural differences between foreign and Turkish pilots flying in the Turkish aviation industry. In addition, significant sub-cultural differences were found among pilots with different training backgrounds and with different titles. Moreover, significant differences in CRM perception of the pilots were found. Furthermore, significant differences in pilots' attitude towards a multinational cockpit were found. The data also revealed that language differences among pilots was acknowledged as a prevalent obstacle in the cockpit communications. These findings may provide a guideline to airlines with multicultural flight crew for implementing customized CRM programs to minimize the effect of these issues on safety. It may also help airlines to be aware of the differences in pilots' attitudes toward a multinational cockpit and operational challenges that cockpit crew may experience due to language diversity in the cockpit.

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## Appendix A

### Measures

<b>Power Distance (PD)</b>
PD 1. People in higher positions should make most decisions without consulting people in lower positions.
PD 2. People in higher positions should not ask the opinions of people in lower positions too frequently.
PD 3. People in higher positions should avoid social interaction with people in lower positions.
PD 4. People in lower positions should not disagree with decisions by people in higher positions.
PD 5. People in higher positions should not delegate important tasks to people in lower positions.
<b>Uncertainty Avoidance (UA)</b>
UA 1: It is important to have job requirements and instructions spelled out in detail so that I always know what I am expected to do.
UA 2: It is important to closely follow instructions and procedures.
UA 3: Rules and regulations are important because they inform me of what is expected of me.
UA 4: Standardized work procedures are helpful.
UA 5: Instructions for operations are important for employees on the job.
<b>Collectivism (COL)</b>
COL 1: At the work place, individuals should sacrifice self-interest for the group.
COL 2: Individuals should stick with the group even through difficulties.
COL 3: Individuals should only pursue their goals after considering the welfare of the group.
COL 4: Group welfare is more important than individual rewards.
COL 5: Group success is more important than individual success.
COL 6: Group loyalty should be encouraged even if individual goals suffer.
<b>Masculinity (MAS)</b>
MAS: It is more important for men to have a Professional career than it is for women.
MAS: Men usually solve problems with logical analysis; women usually solve problems with intuition.
MAS: Solving difficult problems usually requires an active, forcible approach, which is typical of men.
MAS: There are some jobs that a man can always do better than a woman.

**Measures (continued)**

<b>CRM Statements</b>
CRM 1: Language differences between cockpit crews from different countries may cause a threat to safety.
CRM 2: There is less cohesiveness among cockpit crews from different countries.
CRM 3: The pilot I am flying with directly affects my flight performance.
CRM 4: First Officer (F/O) should not question the actions of the captain except when they threaten the safety of the flight.
CRM 5: The airline's rules should not be broken even if the cockpit crew thinks it is in the airline's best interest.
CRM 6: An apparent hierarchy between Captain and F/O has a negative impact on CRM.
CRM 7: I assume that pilots who are more senior, or have more experience than me usually make the right decisions.
CRM 8: Written procedures are necessary for all in-flight situations.
<b>Attitude towards a multinational cockpit</b>
Attitude toward foreigners 1: In general, there are no differences in the flight performance of cockpit crew members from different countries.
Attitude toward foreigners 2: I am confident that cockpit crew members from different countries in a cockpit would react coordinately and effectively in an emergency situation.
Attitude toward foreigners 3: Having foreign pilots in a company has positive effect on CRM (Crew Resource Management).
Attitude toward foreigners 4: I don't mind flying with a Turkish or a foreign pilot.
Attitude toward foreigners 5: I prefer flying with a pilot from my own country than flying with a foreign one.

## Appendix B

## ANOVA Descriptives

<i>ANOVA Descriptives - CRM Statement 4 vs. Age Group</i>							
	Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
CRM4	21-30	59	3.4915	1.22295	.15922	3.1728	3.8102
	31-40	132	3.2803	1.21262	.10555	3.0715	3.4891
	41-50	127	2.8031	1.24747	.11070	2.5841	3.0222
	More than 51	57	2.5088	1.21189	.16052	2.1872	2.8303
<i>ANOVA Descriptives - CRM Statement 5 vs. Age Group</i>							
	Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
CRM5	21-30	59	2.6610	1.24027	.16147	2.3378	2.9842
	31-40	132	3.3485	1.14575	.09972	3.1512	3.5458
	41-50	127	3.3858	1.15503	.10249	3.1830	3.5887
	More than 51	57	3.5088	1.07109	.14187	3.2246	3.7930
<i>ANOVA Descriptives - Attitude Toward Multinational Cockpit vs. Age Group</i>							
	Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Attitude Toward Multinational Cockpit	21-30	59	3.7924	.63679	.08290	3.6264	3.9583
	31-40	132	3.6061	.80736	.07027	3.4670	3.7451
	41-50	127	3.4843	.71945	.06384	3.3579	3.6106
	More than 51	57	3.3816	.75608	.10015	3.1810	3.5822

## Appendix C

*Anti-image Correlation Matrix of Factor Analysis for “Attitude towards a multinational cockpit”*


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	Statement 1	Statement 2	Statement 3	Statement 4
Statement 1	<b>.715<sup>a</sup></b>	-.331	.434	.087
Statement 2	-.331	<b>.738<sup>a</sup></b>	.060	.367
Statement 3	.434	.060	<b>.739<sup>a</sup></b>	-.197
Statement 4	.087	.367	-.197	<b>.770<sup>a</sup></b>

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