

論文

ICAO Language Proficiency Requirements and the training results
of Korea Air Traffic Controller

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ABSTRACT

영어는 1947년부터 국제민간항공기구에 의해 국제 항공공통어로 사용되기 시작하였다. 그러나 원어민을 제외한 대부분 국가의 조종사와 항공교통관제사는 항공영어로 인한 어려움을 토로하고 있으며 항공기 사고의 많은 부분도 항공영어를 사용하는 communication 문제로 발생하고 있다. 이 점을 인식한 ICAO에서는 2008년부터 항공영어의 등급을 제도화하여 비영어권 국가의 항공종사자에 대한 영어능력의 향상을 도모하고 있다. 본 연구는 관제사를 대상으로 한 항공영어교육의 결과를 SPSS11을 이용하여 분석하였다. 분석결과 교육기간과 교육시간이 영어성적 결과에 유의미한 차이를 보이며, 항공영어의 평가요소 6가지가 상호 유의미한 영향을 미치는 것으로 분석되었다.

Keywords : ICAO(국제민간항공기구), Aviation English(항공영어), pilot(조종사), air traffic controller(항공교통관제사), language proficiency rating(영어능력평가등급)

I. Introduction

First operation of B707 in 1960 was the trigger to transform the operation type from short distance flight to long and mass air transportation. Hence demands for the internationally standardized phraseologies are required. In this end, ICAO decided English as a standard language for the international operation in October 1947.

However, among all UN members, native English speaking countries are limited to UK, USA, Canada, Australia, New Zealand, Ireland, and South Africa. The rest countries are either bilingually use it or learn it as a second language. This is the reason a number of pilots and air traffic controllers of many countries have difficulties in using English.

Communication problems between pilots and controllers in aviation English are occurring

ceaselessly, and some happen to lead to major aviation accidents. One of the tragic accidents caused by miscommunication between pilot and controller is KLM and Pan Am collision at Tenerife, Canary Island in March 27, 1997. Aviation experts and/or analysts argue that many of fatal accidents would be avoided if only there were fluent communication exchanged (Verhaegen, 2001).

ICAO resolution(A32-16) strongly urged the provision of strengthened international standards to prevent miscommunication related problems, and at last concern over the role of language in airline accidents turned into action when the ICAO Assembly adopted language proficiency requirements at the 168th meeting (March, 2003). From 2008, pilots and controllers are not allowed to be involved in international operation unless they prove level 4. Aviation English training is now an imminent and important issue, and especially non-native countries are required to prepare the countermeasures along with consistent training. Since the subject of this study, Republic of Korea, is also one of the

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non-native countries, it is going through same problems and implementing various kinds of training to meet the required level.

This study analyzed training results for the aviation English which were conducted in diverse forms and types. It aims to find the most effective aviation English training method which was done by analyzing and comparing the training results of the trainees who have done three different types of training. What this study suggests would help establish a guideline for the aviation English training for non-native English language countries.

II. Aviation English Review

2.1. Background of Aviation English

International operations require common language between pilots and controllers. In this context ICAO states, "The air-ground radiotelephony communications shall be conducted in the language normally used by the station on the ground or in the English" (ICAO Annex 10, 2001). Currently, most of the countries in the world commonly use English as an aviation language based on this requirement. Aviation English is used for radio communication. It means body languages assisting efficient communication can not be used, and in this sense non-native English speaking pilots and controllers radically have challenging conditions for communication. (Beneigh, 2002)

Normally, English used for air traffic compose of 3 to 5 vocabularies (Morrow & Rodvold, 1993) with high speed, and therefore, accurate delivery of the meaning is important. One study suggests that pilots and controllers produce about 50% of read back errors in their communication, and most of them come from pilots (FAA, 1992), and 66% of the errors are corrected by controllers (Cardosi, 1994), that the importance of their role has become prominent.

2.2. Aviation English Training of Korea

In Korea, aviation English first started in 1945 as aircraft was introduced, and first training was conducted by US Air Force who was dispatched to Korea.

Since Korean Air, which was established in 1969, started operation with great number of aircraft, systematic training for aviation English was begun by a recommendation of USA. Aviation English training for 2000~2004 was conducted mainly for pilots, and depending on their proficiency level, training periods differed from 2 weeks to 10 weeks. Since then, recurrent training has been provided in a shorter time period prior to LOFT (Line Operation Flight Training). It is usually done in self-training given native speaking teachers' instruction. On the one hand, the training for air traffic controllers was also done by US Air Force dispatched. Again, there were no particular problems in aviation English because most of air bases were co-used with USAF. Civil airports were gradually constructed and consequently Aviation English training for air traffic controllers were required. Many of controllers completed the training of FAA academy.

In 2005, Korea started to make significant efforts to the training to meet the requirements of ICAO language proficiency. Specifically, native English speakers who majored in aviation English were put into the FAA instructor course and then to the training site. It can be the starting point for the specialized aviation English training.

III. ICAO language proficiency

3.1. Outline of ICAO language proficiency

One State's review of 28,000 safety reports (Yr 2004) revealed that over 70% of the problems cited involved message exchange, and communication errors continue to represent

the largest category of problems reported. Concern over the role of language in airline accidents turned into action in 1998 when the ICAO Assembly assigned high priority to efforts to strengthen provisions concerning language requirements at the 168th meeting (March 5, 2003), and adopted language proficiency requirements for aviation personnel involved with radiotelephony communications now scheduled to become effective in 2008 (ICAO, 2004). Key issues stipulated by ICAO language proficiency requirements are: First, ICAO's Standard English must be intelligible to listeners despite of certain accent or dialect, and is not limited to American or British English(ICAO, 2005).

Second, ICAO rating scale delineates 6 level of language proficiency ranging from Pre-elementary(Level 1) to Expert(Level 6), and personnel involved with international operations must demonstrate proficiency at least Operational(Level 4).

Third, it crosses 6 areas of linguistic description: pronunciation, structure, vocabulary, fluency, comprehension, interaction (ICAO, Annex 1). In this regard, testing criteria for aviation English was provided which will be applied to every aviation context such as routine, emergency, and unusual conditions.

3.2. An Empirical Analysis

3.2.1. Sampling and Methods

This study aims to analyze the training results of controllers who completed the training in Korea, and employs it so as to conduct useful and effective training. Total 166 controllers who completed the aviation English training between March and December of 2005 were used as the analysis samples. Through the first review, 72 people were randomly selected among who had gained similar test scores for aviation English before the training. See <Table 1>. After the training, the trainees were re-evaluated by the

testing program which is officially approved by Korea Civil Aviation Safety Administration(CASA, 2003), and the results are used as a base data for the analysis. SPSS 11 statistics package was the tool used for the analysis, and firstly reliability analysis was conducted using coefficient, Cronbach's alpha. The t-test and ANOVA were also conducted to find out the differences between 3 types of training. Also, multiple regression and relationship were analyzed to find out the relation between 6 testing areas.

Table 1. Survey result

Weeks	hours	trainees	Remarks
8	160 (4 hours/day)	24	No. of trainees in a class: 12 5 days/week
4	160 (8 hours/day)	24	
2	80 (8 hours/day)	24	
Total		72	

3.2.2 Analysis results

(1) Reliability test

In the analysis, testing areas of ICAO were applied as variables. Each variable was named with its initial letter, and number '1' indicates before the training, and number '2' is after it.

L; Level, A; Average, P; Pronunciation, S; Structure, V; Vocabulary, F; Fluency, C; Comprehension, I; Interaction

Reliability and validity are the most basic concepts in analysis. Measuring the level of reliability is to verify the reliability of the analysis method, and Cronbach's α coefficient is the one applied. For the feasibility matter, since testing areas for aviation English are already approved by ICAO validity does not need to be considered further. Level of reliability for each variable is found to be 0.898~0.916, and overall reliability is 0.911, which is very high level.

(2) Analysis between groups of different training periods

Comparison of training results for different training periods assuming that different training periods will bring different training results, average scores of groups before and after the training are compared. Groups are divided into 3 based on the training periods: 2 weeks(60 hours), 4 weeks(120 hours), 8 weeks(120 hours). Even though there are differences in scores and in ratio according to the courses, overall average test scores are improved after the training through all courses. If compare it for each period, for 2 weeks training, average scores are improved from 64.68 to 66.22, which is 1.55 points increase(2.4%), and for 4 weeks and 8 weeks training, they are advanced from 64.78 to 69.82 (4.04 points, 7.8%), from 64.57 to 69.94 (5.37 points, 8.32%) respectively.

In other words, average scores are most greatly improved for 8 weeks training, then for 4 weeks and 2 weeks. The longer the training course, the better the results. Additionally, even though equal training hours(160 hours) are completed, 8 weeks(4 hours/day) accomplished the higher average scores than 4 weeks training (8 hours/day).

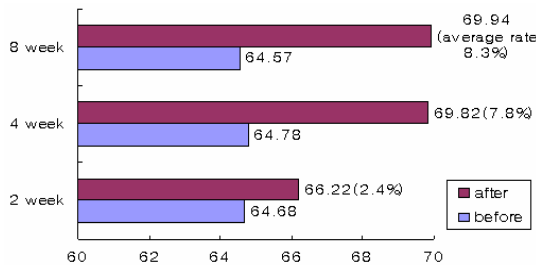


Fig 1. Average scores training result

(3) Comparison of scores for testing factors

Through ANOVA, 6 testing areas are compared. To find out the specific differences for between the training periods, multi-comparison was conducted using Turkey method.

Table 2. Descriptive Statistics and ANOVA

		8 week (n=24)	4week (n=35)	2week (n=36)	F
		mean(S.D)	mean(S.D)	mean(S.D)	
a f t e r	A ²	69.94 (2.60)	68.82 (4.57)	66.22 (5.29)	9.53**
	P ²	72.88 (4.97)	69.10 (5.40)	67.68 (5.89)	1.517**
	S ²	66.40 (6.73)	66.29 (3.86)	65.55 (6.52)	16.83**
	V ²	72.80 (2.65)	71.18 (3.39)	67.76 (7.06)	3.32**
	F ²	67.40 (5.12)	66.94 (3.86)	65.05 (7.60)	4.66
	C ²	72.90 (5.36)	72.06 (3.67)	71.76 (3.90)	6.734
	I ²	72.40 (5.39)	70.47 (2.99)	66.71 (10.0)	30.96**

** p<0.05

Post-training results show that P2, S², V², I2, have statistically meaningful differences for training periods, while F², C2, do not.

- Pronunciation

8 weeks and 4 weeks training had changes of 0.04 and 7.8, respectively, and almost no changes for 2 weeks training. Therefore, in order to improve pronunciation of aviation English, rather long periods of training over 8 weeks are required.

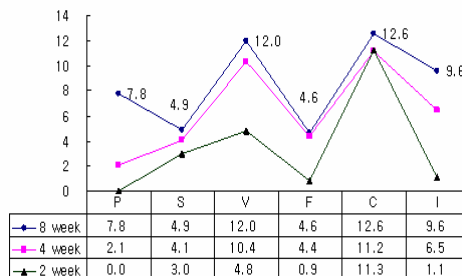


Fig 2. Scores variation

- Structure

Changes (3.0~4.9) are not really big for each period. In other words, structure part need quite amount of time of individual efforts to improve the skill.

- Vocabulary

Each training period showed quite different scores that 8weeks and 4weeks showed 12.0 and 10.4, while 2weeks had relatively low score changes. It is probably because aviation

English requires limited specialized vocabularies, therefore, 8weeks of training can have good effects.

- Fluency

It showed relatively lower changes than other subjects; 4.6 for 8weeks, 4.4 for 4weeks, and 0.9 for 2weeks. It would take time to be improved since all other subjects have to be considered as well.

- Comprehension

8weeks training showed 12.6, and 4weeks and 2weeks also represented high score changes of 11.2. It is mainly due to the trainees. They are either controllers or aviation personnel on the job, so they basically have job related knowledge which would lead to such results.

- Interaction

9.6 for 8weeks, and 6.5 for 4weeks. However 2weeks training only represented 1.1.

In other words, interaction can be advanced through long periods of time given improvement of other areas.

(4) Correlation between factors

Evaluation of ICAO aviation English is done by collectively assessing 6 subjects, P^2 , S^2 , V^2 , F^2 , C^2 , I^2 . Relationship between subjects is analyzed as follows.

Table 3. Correlations between factors

	A^2	P^2	S^2	V^2	F^2	C^2
P^2	.369*					
S^2	.718**	.464				
V^2	.645*	.266	.722**			
F^2	.654**	.335	.663**	.460**		
C^2	.182	.119	.067	.152	.195	
I^2	.740**	.281	.657**	.747**	.570**	.318

** $p < 0.01$, * $p < 0.05$

- Average

Average score and each score are usually related to each other, however, comprehension part does not necessarily have statistically meaningful relationship with the average score.

- Pronunciation

It has meaningful relationship with the

average but not with other subjects. It is probably because the criteria for pronunciation allow certain accents and intonation which does not belong to American or British English.

- Structure

It had meaningful relationship with vocabulary, fluency, interaction, but not with pronunciation and comprehension. It means structure and vocabulary have to be based to achieve fluency and interaction quality.

- Vocabulary

It had meaningful relationship with structure, fluency, interaction, but not with pronunciation and comprehension. It has a similar tendency with structure.

- Fluency

It had meaningful relationship with the average, vocabulary, interaction, but not with pronunciation and comprehension.

- Comprehension

It showed no meaningful relationship with any of subjects.

IV. Conclusion

This study has significant meaning in two aspects; aviation English, which will play crucial role to aviation personnel from 2008, has been covered, and analysis with actual records of trainees who completed the aviation English course in Korea are conducted based on their test scores before and after the training. Followings are the results driven from the analysis. The subjects of this study, aviation English training of Korea for 2005, have been analyzed for two groups of current air traffic controllers and pilots in 3 different types(80 hours-2 weeks, 160 hours-4 weeks, 160 hours-8 weeks).

The effectiveness of the training was best for 8 weeks-160 hours > 4 weeks-160 hours > 2 weeks-80 hours, in order. Especially, the duration of the training showed meaningful differences to Average, Pronunciation, Vocabulary, Interaction. In the relationship between each area and average scores, most

of the areas showed meaningful relationships, however, there found no meaningful relationships with comprehension area, as well as Pronunciation. Based on such results, following conclusion and recommendations were made in respect of aviation English training in non-native English speaking countries.

First, aviation English requires lengthy period of training. As the results suggested, training periods longer than 4 weeks(160 hours) show meaningful accomplishments, and 160 hours for longer period of time, 8 weeks, was found more efficient. It is recommended to take this into consideration when non-native countries are trying to establish aviation English training courses.

Second, preliminarily acquired skill for grammar and plain English is required prior to have aviation English training. Even though aviation English is the specialized field used by aviation personnel, most of the contents are founded on plain English. One of the results surfaced that Structure achieved relatively low accomplishments compared to other areas even after the training. It is one of the problems caused related to general English skill.

Therefore, a trainee who already acquired certain level of plain English might likely achieve better results for aviation English when they attend the training.

Third, strive to have standard pronunciation. Analysis didn't say that pronunciation has a meaningful relationship with other testing factors, however, it is due to its very generous testing criteria published in the first aviation English test criteria. In reality, it often causes communication difficulties for pilots from non-native countries. In other words, even though he reached the level required by ICAO or his nation, he still has communication problems due to the pronunciation, which could result in situational awareness problems. It should be complemented.

Forth, comprehension difficulties in emergency situation. Aviation English to be

evaluated in the most of the states consists of the phraseologies which are used in normal conditions by pilots and controllers. Comprehension, therefore, didn't show any significant relationship with other testing factors of aviation English.

Aircraft is traffic object which conducts relative operation in 3 dimensional space that is easily affected by other objects and emergency situation. In this case, wrong judgment for the situation, the comprehension problem could lead to an accident. Careful training is required. This study analyzed the accomplishments after the training for the aviation English achieved by trainees of non-native English states in an experimental trial manner.

It can be considered significantly suggestive as it is analyzed based on the actual test scores after the aviation English training.

A lot of support from other nations is encouraged for non-English speaking states to effectively and pro-actively proceed their aviation English training, hopefully based on this study, along with the individual efforts of aviation personnel.

Reference

- [1] Beneigh, Ted, and Stratechuk Taras. (2002), "Multicultural Crew Communication and It's Effect on Airline Safety: Proposed Solutions" Conference to 50th Anniversary of Hankuk Aviation University, 19-35.
- [2] Cardosi, K.(1994), "An Analysis of En Route Controller-Pilot Voice Communications,"DOT/ FAA/RD-94/15.
- [3] Civil Aviation Safety Authority, (2003), Korea's rating scales (CASA Notice, 2003-32)
- [4] FAA (1992), "Altitude Deviation Study : A Descriptive Analysis of Pilot and Controller Incidents Final Report,".

- Influence of ATC Message Length and Timing on Pilot Communication, NASA Contract Report, 177621.
- [9] Verhaegen, B. (2001). Safety issues related to language use have come under scrutiny.
- [10] .ICAO (2004), ICAO Journal, 56(2), 15-17, 30.
- [5] ICAO (2004) Annex10, Aeronautical Telecommunication VolII Communication Procedure Including those PANS Status.
- [6] ICAO Doc 9835 AN/453, Manual on the Implementation of ICAO Language Proficiency Requirements.
- [7] ICAO (2004), ICAO Journal Volume 59.
- [8] Morrow, D. and Rodvold, M (1993), The