

## Technical Review

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# A Study on the Influence of Flight Trainees' Stress on Flight Immersion and Abandonment

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## ABSTRACT

Stress refers to various body reactions that occur when humans are stimulated by environmental conditions. The quality of education and flight skills can suffer if flight trainees are constantly subjected to high stress, even in the case of flight trainees, and as a result, it can harm becoming a pilot. It is therefore the aim of this study to identify stress factors (flight training, career, financial support, relationships with family and teachers) that student pilots face, to determine how these factors affect flight and academic immersion and abandonment, and to improve the quality of flight education.

**Key Words** : Stress(스트레스), Flight Immersion(비행 몰입), Flight Abandonment(비행 포기), Flight Trainee(비행 교육생), Multiple Regression(다중회귀)

## I. INTRODUCTION

From the Wright brothers until today, aircraft operation has grown exponentially. Consequently, the aviation market has made rapid progress so far with numerous advancements, such as the first modern civil passenger aircraft, the B247 that operated in 1933, the advent of the jet-engine passenger aircraft Comet which was influenced by world war 2, the B747 which led to the popularization of air travel, and the B767

which is the 4th generation of jet aircraft [1].

Amidst this remarkable progress in aviation operation, pilots are some of the highest-earning jobs and are highly sought after by many. However, it is also a stressful job due to the responsibility for the lives of many people, the need to react quickly to emergencies and the difficulty in making judgments about aircraft, etc., compared with other occupations [2].

Flight trainees who want to become pilots are also exposed to various stresses in the above circumstances while aviation training institutions are creating detailed and systematic training programs to produce excellent pilots. Additionally, several Korean universities train flight trainees, and these universities combine various liberal arts and major classes, including flight practice. Having to balance academic studies and flight instruction at the same time is not uncommon for flight trainees, so they are often physically and mentally stressed [3].

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Stress is a variety of reactions in the body that occur when humans are stimulated by environmental factors. It also refers to a condition where one's mind is hurt or intimidated. Stress destroys our mental and physical functions and weakens our bodies' ability to adapt to the surrounding environment. Stress comes from an imbalance or mismatch between what is required by the surrounding environment and what one can do or it occurs when importance is emphasized [4]. The result of too much stress is not only losing interest in what one is doing, but also contributing to negative thoughts, resulting in exhaustion and slump, affecting confidence and overall performance [5].

Stress management is important to anyone. In particular, in the case of flight trainees the exposure to constant high stress increases the possibility of problems in improving the quality and skills of education, and hence the surrounding relationship with professors, instructors, and friends may deteriorate. As a result, this can have a negative effect when they become pilots. Furthermore, these adverse effects are maintained even as flight trainees later work for airlines, which can reduce the overall quality of pilots and may increase the probability of the risk of air accidents [6]. In addition to managing the stress of flight trainees, stress management is also necessary to protect individual students from stress as a result of increased frequency of experiencing stress [7] or giving up mid-flight education in order to achieve their dreams.

Therefore, the purpose of this study is to identify the stressors (flight education, future problems, family or financial problems, professor or instructor problems), investigate and analyze how these factors affect flight immersion and flight abandonment.

## II. BODY

### 2.1 Theoretical Background

Flight trainees are not the subject of most

studies on stress, but many previous studies have already been conducted on various stressors related to aviation. Choi, E. (2011) studied that stress causes airline pilots to suffer from loss of vitality, low morale, job dissatisfaction, and distortion of communication, which eventually affects their intention to change jobs [8], and Cho, S. (2006) studied that the stress of airline flight attendants can lead to problems in their job attitude [9]. Therefore, this study was conducted because it was necessary to consider the stress of flight trainees preparing for it as well as incumbent pilots and flight attendants.

### 2.2 Research Methods

The statistical processing of the collected data was analyzed using the SPSS v. 21.0 statistical package program through data coding and data cleaning processes. First, frequency analysis was conducted to identify the general characteristics of research respondents. Second, exploratory factor analysis was conducted to verify the feasibility of the measurement tool, and the Cronbach's  $\alpha$  coefficient was calculated to verify reliability. Third, descriptive statistical analysis was conducted to find out the stress, immersion in flight, and abandonment of flight, and independent samples  $t$ -test and one-way ANOVA were conducted to find out whether there was a difference according to the general characteristics of the survey subjects, and Duncan test was conducted as a post-test method. Lastly, correlation analysis was conducted to determine the correlation between each variable, and linear regression analysis was used to verify the hypothesis.

## III. RESULTS

### 3.1 Demographic Characteristics of the Sample

Table 1 shows the results of frequency analysis

Table 1. Demographic characteristics of the sample

Division		Frequency (N)	Percentage (%)
Gender	Male	193	85.4
	Female	33	14.6
Flight education step	Private pilot course (before first solo flight)	125	55.3
	Private pilot course (after first solo flight)	28	12.4
	Instrument flight rating course	21	9.3
	Commercial pilot course	18	8.0
	Pilot training certification course	34	15.0
Total		226	100.0

to find out the general characteristics of the survey respondents.

### 3.2 Verification of the Feasibility and Reliability of Measurement Tools

The variables were analyzed using exploratory factor analysis. Principal component analysis was used as the factor analysis method, and factor analysis was performed based on Varimax's rotation, assuming independence between factors, and at least 1 eigenvalue. The factor loading value, which represents the correlation between variables, is considered significant when it is 0.40 or higher, and when it exceeds 0.50, it is regarded as a very important variable [10].

Moreover, reliability can also be defined as the consistency of measured variables and variance between measurements for a unified concept over time. This study verified the reliability by calculating the Cronbach's  $\alpha$  coefficient used when using a scale composed of multiple items for one concept, and generally

interpreted that there is no problem in reliability if the alpha coefficient is 0.60 or higher [11].

#### 3.2.1 Verification of the feasibility and reliability for stress

The results of the feasibility and reliability tests for stress are presented in Table 2. The loading value of a total of four factors was 0.40 or more, so it was judged that the validity was

Table 2. Validation &amp; reliability for stress

Division	Question	Component			
		Factor 1	Factor 2	Factor 3	Factor 4
Flight education	3. I get stressed when I can't concentrate and have no confidence.	.868	.009	.155	.094
	4. I get stressed because of the pressure for flying.	.842	.134	.221	.092
	2. I get stressed when I don't have a break after the flight.	.839	.127	.243	.093
	1. I get stressed because the amount of flight is not as much / little as I want.	.835	.189	.226	.103
Professor or instructor problems	12. I am stressed out because I don't get along with my professor or instructor.	.183	.853	.055	.159
	14. I am stressed out because professors or instructors treat me differently from other students.	.140	.845	.003	.173
	15. I am stressed when I'm pointed out by professors or instructors.	.064	.805	.129	.153
	13. I am stressed because things do not go well as the professors or instructors tell me to.	.038	.714	.334	.143

Table 2. Continued

Division	Question	Component			
		Factor 1	Factor 2	Factor 3	Factor 4
Factor 3 Future problems	5. I am stressful worrying that I cannot get a job as a private pilot or a military pilot.	.288	.114	.868	.120
	6. I am stressful because I am afraid I will not succeed after I get my pilot's license.	.282	.166	.863	.045
	7. Sometimes I think my future is uncertain.	.255	.134	.828	.191
Factor 4 Family or financial problems	10. I am stressed because there is lots of parents' interference.	.102	.326	-.038	.800
	11. I am stressed because there is lots of parents' expectation.	.003	.242	.148	.789
	9. I am stressed when I'm interfered with my private life.	.111	.051	.014	.784
	8. I'm stressed because of the financial burden of flying.	.152	.071	.322	.744
Eigen value		3.196	2.900	2.625	2.620
Variance description (%)		21.307	19.334	17.498	17.465
Cumulative description (%)		21.307	40.641	58.140	75.605
Reliability		.908	.861	.911	.828

KMO=.856, Bartlett's test  $\chi^2=2,125.919$  ( $df=105$ ,  $p<.000$ ).

verified, and the reliability was 0.60 or more, indicating that there was no problem.

### 3.2.2 Verification of the feasibility and reliability of flight immersion

The results of verification of the feasibility and reliability for flight immersion are shown in Table 3. The loading value of a total of one factor was 0.40 or more, so it was judged that the validity was verified, and the reliability was 0.60 or more, indicating that there was no problem.

Table 3. Validation & reliability for flight immersion

Division	Question	Component
		Factor 1
Factor 1 Flight immersion	4. I want to learn more about what I have learned.	.930
	5. I try to make new content that I learned in class as mine.	.906
	1. I participate by focusing on flight theory and practical training.	.889
	3. I enjoy the class.	.882
	2. I prepare for my prior planning of flight and my school studies thoroughly.	.829
Eigen value		3.942
Variance description (%)		78.840
Cumulative description (%)		78.840
Reliability		.932

KMO=.871, Bartlett's test  $\chi^2=967.539$  ( $df=10$ ,  $p<.000$ ).

### 3.2.3 Verification of the feasibility and reliability for flight abandonment

The results of verification and reliability for flight abandonment are shown in Table 4. The loading value of a total of one factor was 0.40 or more. The validity of the study was verified, and the reliability was 0.60 or higher, which indicated that there was no problem.

## 3.3 Technical Statistical Analysis

### 3.3.1 Stress

The results of the analysis on the stress of flight trainees are as shown in Table 5. Overall, it indicated that "future problem stress" was the highest as  $M=3.77$ , and average stress was 3.27 points. It is assumed that the situation that most students are facing in the present is important, but due to the nature of flight

Table 4. Validation &amp; reliability for flight abandonment

Question		Com- ponent
		Factor 1
Factor1  Flight aban- donment	3. I've thought about quitting flying because I don't like the educational facilities and the environment of flying.	.901
	2. I've thought about quitting flying because of professors or instructors.	.865
	1. I've thought about quitting flying because I am not good at flying as anyone else.	.793
	5. I've thought about quitting flying because of uncertainty about the future.	.790
	4. I've thought about quitting flying because of family reasons.	.774
Eigen value		3.412
Variance description (%)		68.236
Cumulative variance description (%)		68.236
Reliability (Cronbach's $\alpha$ )		.881

KMO=.818, Bartlett's test  $\chi^2=633.184$  ( $df=10$ ,  $p=.000$ ).

education, the financial part required to prepare is larger than that of other jobs, so the strain on the possibility of employment difficulties was greatly affected.

There was a statistically significant difference between overall stress and sub-factor stress after analyzing whether there was a difference according to the general characteristics of the survey subjects. And women tended to be more stressed than men in the same situation judging from the sub-factor stress of Future problems, Family or financial problems, and Professor or instructor problems.

In addition, there was a statistically significant difference between overall stress and stress by sub-factor depending on the flight

education step ( $p<.05$ ), in the case of the pilot training certification course, the overall stress and the stress of the professor or instructor problem. There was a significant difference between pilot training certifications and commercial pilot course, showing that flight education and future problem stress were relatively high.

### 3.3.2 Flight immersion, Flight abandonment

Table 6 shows the results of analyzing the flight immersion of flight trainees and the abandonment of flight. As a result of the analysis, the overall flight immersion was 3.78 points on average, and the average flight abandonment was 2.93 points on average.

As a result of analyzing whether there is a difference according to the general characteristics of the survey respondents, there was no statistically significant difference depending on gender and flight education step ( $p>.05$ ).

### 3.4 Correlation Analysis

The results of analyzing the correlation between each variable are shown in Table 7. According to the result of the analysis, stress was found to have a statistically significant negative (-) correlation with flight immersion by sub-factors of stress of flight education ( $r=-.391$ ,  $p<.001$ ), future problem ( $r=-.330$ ,  $p<.001$ ), family or financial problems ( $r=-.424$ ,  $p<.001$ ), professor or instructor problems ( $r=-.430$ ,  $p<.001$ ). Stress was found to have a statistically significant positive (+) correlation with flight abandonment by sub-factor of the stress of flight education ( $r=.431$ ,  $p<.001$ ), future problems ( $r=.479$ ,  $p<.001$ ), family or financial problems ( $r=.430$ ,  $p<.001$ ), professor or instructor problems ( $r=.591$ ,  $p<.001$ ). Besides, Flight immersion was found to have a statistically significant negative (-) correlation with flight abandonment ( $r=-.444$ ,  $p<.001$ ).

Table 5. Stress of flight trainees

Division		Stress								Total	
		Flight education		Future problems		Family or financial problems		Professor or instructor problems			
		M	SD	M	SD	M	SD	M	SD		
Gender	Male	3.45	.968	3.71	1.090	3.10	.885	2.72	.972	3.21	.697
	Female	3.73	.768	4.13	.740	3.48	.835	3.27	.878	3.62	.567
	<i>t</i> -value ( <i>p</i> )	-1.623 (.106)		-2.770** (.007)		-2.268* (.024)		-3.074** (.002)		-3.802*** (.000)	
Flight education step	Private pilot course (before first solo flight)	3.25 <sup>a</sup>	1.015	3.58 <sup>ab</sup>	1.059	3.19	.850	2.75 <sup>a</sup>	.961	3.17 <sup>a</sup>	.729
	Private pilot course (after first solo flight)	3.65 <sup>ab</sup>	.834	3.82 <sup>ab</sup>	1.036	3.13	.762	2.75 <sup>a</sup>	1.047	3.31 <sup>a</sup>	.568
	Instrument flight rating course	3.67 <sup>ab</sup>	.695	3.46 <sup>a</sup>	1.176	3.01	.976	2.73 <sup>a</sup>	.990	3.20 <sup>a</sup>	.729
	Commercial pilot course	3.81 <sup>b</sup>	.673	4.13 <sup>bc</sup>	.978	2.85	.900	2.39 <sup>a</sup>	.948	3.24 <sup>a</sup>	.451
	Pilot training certification course	3.96 <sup>b</sup>	.767	4.45 <sup>c</sup>	.651	3.29	1.036	3.28 <sup>b</sup>	.857	3.70 <sup>b</sup>	.594
	<i>F</i> -value ( <i>p</i> )	5.352*** (.000)		6.022*** (.000)		.953 (.434)		3.086* (.017)		4.229** (.003)	
Total		3.49	.945	3.77	1.055	3.16	.886	2.80	.977	3.27	.693

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001.

Duncan : a<b<c

Table 6. Flight immersion & abandonment

Division		Flight immersion		Flight abandonment	
		M	SD	M	SD
Gender	Male	3.82	.708	2.90	1.018
	Female	3.53	.914	3.12	.933
	<i>t</i> -value ( <i>p</i> )	1.776 (.084)		-1.170 (.243)	
Flight education step	Private pilot course (before first solo flight)	3.80	.684	2.81	.983
	Private pilot course (after first solo flight)	3.93	.579	3.11	1.080
	Instrument flight rating course	3.97	.741	2.96	1.189
	Commercial pilot course	3.71	.614	2.89	.780
	Pilot training certification course	3.49	1.053	3.24	.988
	<i>F</i> -value ( <i>p</i> )	1.970 (.100)		1.501 (.203)	
Total		3.78	.747	2.93	1.007

Table 7. Correlation between each variable

Division	Stress				Flight immersion	Flight abandonment
	Flight education	Future problems	Family or financial problems	Professor or instructor problems		
Flight education	1					
Future problems	.535***	1				
Family or financial problems	.271***	.310***	1			
Professor or instructor problems	.304***	.339***	.420***	1		
Flight immersion	-.391***	-.330***	-.424***	-.430***	1	
Flight abandonment	.431***	.479***	.430***	.591***	-.444***	1

\*\*\**p*<.001.

Table 8. Effect of stress on flight immersion

Division	Non-standardization factor		Standardization factor	<i>t</i>	<i>p</i>
	B	S.E	$\beta$		
(Invariable)	5.706	.205		27.896	.000
Flight education	-.177	.053	-.224	-3.335**	.001
Future problems	-.037	.048	-.053	-.772	.441
Family or financial problems	-.207	.053	-.246	-3.909***	.000
Professor or instructor problems	-.184	.049	-.241	-3.775***	.000

$R^2=.312$ , Adj.  $R^2=.300$ ,  $F=25.107^{***}$ ,  $p<.000$ , Durbin-Watson=2.000

\*\* $p<.01$ , \*\*\* $p<.001$ .

### 3.5 The Verification of Hypotheses

#### 3.5.1 Verification of hypothesis 1

Table 8 shows the results of multiple regression analysis to verify the effect of stress on flight immersion of flight trainees. As a result of the analysis, the explanatory power of the regression model was 31.2%, and the regression equation was analyzed to be statistically significant ( $F=25.107$ ,  $p<.001$ ). Family or financial problems ( $\beta=-.246$ ,  $p<.001$ ), professor or instructor problems ( $\beta=-.241$ ,  $p<.001$ ), and flight education ( $\beta=-.224$ ,  $p<.01$ ) by sub-factors of stress were found to have a statistically significant negative (-) effect on flight immersion. Therefore, it can be seen that the higher the family or financial problems, professor or instructor problems, and flight education stress by sub-factors of stress are, the lower the flight immersion is.

#### 3.5.2 Verification of hypothesis 2

Table 9 shows the results of multiple regression analysis to verify the effect of stress on flight abandonment of flight trainees. As a result of the analysis, the explanatory power of the

Table 9. Effect of stress on flight abandonment

Division	Non-standardization factor		Standardization factor	<i>t</i>	<i>p</i>
	B	S.E	$\beta$		
(Invariable)	-.122	.241		-.505	.614
Flight education	.164	.062	.154	2.620**	.009
Future problems	.201	.057	.211	3.530**	.001
Family or financial problems	.172	.063	.151	2.743**	.007
Professor or instructor problems	.422	.058	.410	7.345***	.000

$R^2=.474$ , Adj.  $R^2=.465$ ,  $F=49.815^{***}$ ,  $p<.000$ , Durbin-Watson=1.798

\*\* $p<.01$ , \*\*\* $p<.001$ .

regression model was 47.4%, and the regression equation was analyzed to be statistically significant ( $F=49.815$ ,  $p<.001$ ). Professor or instructor problems ( $\beta=.410$ ,  $p<.001$ ), future problems ( $\beta=.211$ ,  $p<.01$ ), flight education ( $\beta=.154$ ,  $p<.01$ ), and family or financial problems ( $\beta=.151$ ,  $p<.01$ ) by sub-factors of stress had a statistically significant positive (+) effect on flight abandonment.

Therefore, it can be seen that the higher the stress of professor or instructor problems, future problem, flight education, family or financial problems by sub-factors of stress is, the higher the flight abandonment is.

#### 3.5.3 Verification of hypothesis 3

Table 10 shows the results of a simple regression analysis to verify the effect of flight immersion on flight abandonment. As a result of the analysis, the explanatory power of the regression model was 19.7%, and the regression equation was analyzed to be statistically significant ( $F=55.115$ ,  $p<.001$ ). Flight immersion as an independent variable ( $\beta=-.444$ ,  $p<.001$ ) was found to have a statistically significant negative (-) effect on flight abandonment. Therefore, it

Table 10. Effect of flight immersion on abandonment

Division	Non-standardization factor		Standardization factor	<i>t</i>	<i>p</i>
	B	S.E	$\beta$		
(Invariable)	5.198	.311		16.709	.000
Flight immersion	-.599	.081	-.444	-7.424***	.000

$R^2=.197$ , Adj.  $R^2=.194$ ,  $F=55.115^{***}$ ,  $p=.000$ , Durbin-Watson=1.749

\*\*\* $p<.001$ .

can be seen that the higher the flight immersion is, the lower the flight abandonment is.

#### IV. CONCLUSION

This study aimed to examine the various stresses that flight trainees face as they prepare for their future careers. The survey results show that most survey respondents were greatly stressed, and there was a lot of stress, when it came to the future. This is because it seems to be expected to face difficulties in getting a job in the future due to the characteristic of the job of the aircraft pilot. In addition, unlike other occupations, it is judged that it comes as a big problem because of the large number of efforts such as time and economic burden spent preparing.

As verified in the hypothesis, this stress not only lowers the immersion of flight trainees but also affects the flight abandonment. Therefore, to manage stress properly, various dimensions must be considered as well as, research aimed at identifying and adapting to various situations, not restricted to a specific situation, and to ensuring safe operations and flight education.

Identifying and preparing systematic management measures for civilian and military pilots as well as flight trainees are expected to be a potential future research project that will enhance aviation safety in Korea.

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