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Availability of Proficient Entry-level Airline Pilots: A Factor in Four of Six Hiring Criteria Tested

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ABSTRACT

This study was conducted to determine if a relationship exists between the availability of proficient entry-level airline pilots and the level of flight training required of new-hire pilots at regional airlines. Hiring criteria were used to represent the level of flight training of entry-level pilots. In four of six hiring criteria tested, availability of proficient entry-level pilots proved to be a factor in adherence to or relaxation of the hiring criteria by regional airlines.

INTRODUCTION

The purpose of this study was to determine if a relationship exists between the availability of proficient entry-level airline pilots and the level of flight training of new-hire pilots at regional airlines, whereby, when the supply of proficient entry-level airline pilots is low the hiring criteria used to determine the entry-level pilot's level of flight-training may be relaxed. Therefore, it is possible that, in times of air-carrier-quality pilot shortage, the level and quality of the pilot's flight-training, before the entry-level hire, is not up to an acceptable standard. The AREF report (Proctor, 1988a) found that, "heavy pilot demand by better-paying major airlines and lower military pilot output caused some regionals to experience pilot turn-over rates as high as 120%" (p. 126). The Regional Airline Association (Simulators, 1988) said the high turnover rate, "does not allow for sufficient seasoning of the SIC [second in command] prior to assuming the responsibilities of PIC [pilot in command]" (p. 128).

At issue is the practice of using flight-time hours of experience rather than the required pilot proficiencies as the main criteria in hiring new pilots. A pilot may have the required number of flight-time hours of experience and yet not be proficient in performing all the tasks faced by an entry-level pilot. Ott (1990) wrote, "timed-based training is deficient in that it does not measure the level of learning that has taken place" (p. 68).

Background and Rationale of the Study

Air safety may unquestionably be the most important reason that the air transportation industry has a critical need for training safety-minded, proficient, crew-oriented, air-carrier-quality pilots. Regarding air safety, FAA Administrator Allan McArtor (McArtor, 1987), speaking to about 250 airline chief pilots said, "If aviation professionals don't change the future of aviation, then the non-pilots will" (p. 34).

Chief pilots are considered the top pilots of airlines (McArtor, 1987). These individuals are management personnel, knowledgeable of their airlines' operations specifications, and applicable Federal Aviation Regulations (Jeppesen, 1981) and for these reasons were selected as the respondents in this study. Additionally, it was assumed that the chief pilots surveyed responded based on a reasonable knowledge of the hiring practices within their respective regional airlines.

A pilot generally records flight experience and training in a pilot logbook as evidence that he or she meets the hiring criteria of a prospective employer. In addition, hiring criteria, such as class of flight physical exam and any visual-acuity limitations are recorded on a medical

certificate. A pilot's education level can be determined by official school records.

The Airline Deregulation Act of 1978, and resulting marketplace-driven changes, influenced many components of the nation's air-transportation industry. As Schukert and Maples (1990) wrote, "Air transportation in America is in a state of ferment. Deregulation-spawned industry growth and . . . . an anticipated pilot shortage" (p. 1). This growth contributed to the growing demand for safety-minded, well-trained, proficient, crew-oriented, air-carrier-quality pilots, for the total air-transportation industry in the United States.

Hiring Criteria of Pilots

This study focused on the relationship between the availability of proficient entry-level airline pilots and the level of flight training of new-hire pilots at regional airlines. Proctor (1988a) indicated there is a paucity of precise data on hiring criteria of entry-level pilots. Proctor wrote:

> Although precise new-hire qualification data are not available, Air Midwest, a commuter based in Wichita, Kansas, said it was able to recruit pilots in 1983 with between 2,000-5,000 hours experience. The firm cited a 2% annual turnover, as well. First officers hired by Air Midwest in 1986 and 1987 averaged only 1,800 hours experience and pilot staff turnover was 33%. (p. 126)

In 1989, the average flight-hours of new-hire pilots by regional airlines were 2,702 (Future Aviation Professionals of America [FAPA], 1990). The range measurements were 300 to 20,000 flight-hours, a variation of 19,700 hours. FAPA did not show the standard deviation.

The six qualification categories of FAPA's (1990), statistical table of new-hire pilots are: (a) flight ratings and certificates, (b) flight experience, (c) aviation background, (d) branch of military, (e) education, and (f) physical data. Of the six hiring criteria, flight experience appears to be the most important. As suggested by K. L. Tallman (personal letter September 4, 1990), a major hiring criterion of most commercial airlines is total flight-time. Proctor (1988), reported hours of experience as a major hiring criterion of new-hire pilots at Air Midwest. Also, the main qualification requirement of new-hire pilots at West Air was total flight-time.

METHODOLOGY

This study used "The Single Cross Section" sample survey-research design suggested by Warwick and Lininger (1975, p. 57). Campbell and Katona (1966) previously had stated, "This is the method 'par excellence' for the determination of the characteristics of a population at a specific point in time" (p. 22).

The dependent variable was hiring criteria. The independent variable was the availability of proficient new-hire entry-hire pilots. The independent variable (regional airlines) as used in the design of this study, was assigned rather than being a manipulated independent variable.

The Population and Sample

The population for this study was the 186 United States regional airlines listed in the Airline Directory of the *1990 Annual Report of the Regional Airline Association* (Regional Airline Association [RAA], 1990).

The sample size used in this study was 126 United States regional airlines. According to sample size formula shown by the research Division of the National

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Educational Association 126 was the correct sample size for a population of 186 (National Education Association [NEA], 1960, December).

The results, after attempts were made to contact 19 non-respondents by telephone, were (a) 4 usable surveys returned, and (b) 1 unusable survey returned. Therefore, the final tallies of this study are (a) 112 (88.9 percent) of the random sample returned survey questionnaires, (b) 102 (81 percent) were usable, (c) 10 (7.9 percent) were unusable, and (d) non-respondents totaled 14 (11.1 percent). Summary data of the population, random sample, usable and unusable surveys returned by the regional airlines, and non-respondents of this study are shown in **Table 1.**

wrote, "In tests of independence two variables are involved . . . . The question arises as to whether the two variables are independent of each other" (pp. 219-220). Such variables are generally of the nominal case (Ferguson and Takane, 1989).

Data were arranged in either a 2 x 2, 2 x 3, or a 2 x 4 contingency table, and observed (O) and expected (E) frequencies were compared. The E frequencies for each cell were obtained by multiplying respective row totals by column totals and dividing by the total number of cases.

Tables similar to **Table 2** were set up for each item from Section 1 and 2 of the survey questionnaire. Tables similar to **Table 3** were used for the purpose of calculating χ^2 values. The calculated values

Table 1
Survey Returns

Population	Regional Airlines			
	Random Sample	Usable Surveys	Unusable Surveys	Non-Respondents
186	126	102 (80.9) [a]	10 (7.9) [a]	14 (11.1) [a]

[a] Numbers shown in ( ) are percentages based on the random sample. Because of rounding, these percentages total only 99.9.

Statistical Analysis

Data obtained from the questionnaires used in this research are appropriate for descriptive studies. The data was processed using *The Student Edition of Minitab* (Schaefer and Anderson, 1989), a statistical software package.

The χ^2 test of independence was the most appropriate test for significance of any differences between data collected from section 1 and 2 of the survey questionnaires. Ferguson and Takane (1989) obtained ($\chi^2 = \Sigma(O - E)^2/E$) were then compared to the critical values of χ^2 listed in Table C (Ferguson and Takane, 1989).

DATA PRESENTATION, ANALYSES, AND FINDINGS

The survey questionnaire contained six hiring criterion categories used in hiring entry-level pilots (FAPA, 1990). The three categories that show a person's level of flight training are (a) certificates and ratings, (b) turbine experience, and (c) total time/hours. The other three cate-

Table 2
Hiring Criterion

Hiring Criterion	Availability of Entry-Level Pilots				
	Shortage		No-Shortage		Total
Name of Criterion					
Level 1	1.[a]	(2.0)[b]	3	(2.0)	4
Level 2	18	(22.2)	26	(21.8)	44
Level 3	42	(39.3)	36	(38.7)	78
Level 4	10	(7.6)	5	(7.4)	15
Total	71		70		141

[a] Observed cell frequencies (hypothetical data).
[b] The expected cell frequencies are shown in ( ).

Table 3
χ^2 for Data of Table 2

O	E	O - E	$(O - E)^2$	$(O - E)^{2/E}$
1	2.0	-1.00	1.00	0.50
3	2.0	1.00	1.00	0.50
18	22.2	-4.20	17.64	0.79
26	21.8	4.20	17.64	0.81
42	39.3	2.70	7.29	0.19
36	38.7	-2.70	7.29	0.19
10	7.6	2.40	5.76	0.76
5	7.4	-2.40	5.76	0.78
141.00	141.00	$X^2 = \Sigma(O - E)^2/E = 4.52$		

gories (a) education level, (b) visual acuity, and (c) class of flight physical exam, are soft hiring-criteria that can change without affecting a person's flying ability (FAPA, 1990).

In Section 1 of the survey questionnaire (see Appendix A), the respondents were to assume an existing shortage of air-carrier-quality entry-level pilots. In Section 2, the respondents were to assume a no shortage of air-carrier-quality entry-level pilots.

Six χ^2 tests were run on the data gathered. Further, the .05 level of significance was selected for the χ^2 statistical tests in analyzing the data. The missing-data cases were distributed proportionately among the categories of known data.

Null hypothesis. There are no differences in regional airlines' hiring criteria, used to determine the entry-level pilot's level of training, in times of shortage of proficient entry-level airline pilots, compared to times when there in no shortage

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of proficient entry-level pilots.

The data in **Table 4** show the relationship between the availability of entry-level airline pilots and the hiring criterion certificates and ratings required by regional airlines of new-hire pilots. The calculated χ^2 value was (1, $\underline{N}$ = 102) = 16.27. Since 16.27 is > 3.84, for $\underline{df}$ = 1, $\underline{p}$ < .05, the null hypothesis was rejected.

Table 5 data show the relationship between the availability of entry-level airline pilots and the hiring criterion turbine experience, required by regional airlines of new-hire pilots. The calculated χ^2 value for the data was (1, $\underline{N}$ = 102) = 12.88. Since 12.88 is > 3.84, for $\underline{df}$ = 1, $\underline{p}$ < .05, the null hypothesis was rejected.

Table 6 presents the data with respect

Table 4
Hiring Criterion and Certificates and Ratings

Hiring Criterion / Certificates and Ratings	Availability of Entry-Level Pilots				Total
	Shortage		No-Shortage		
Airline transport pilot	25	(24.5)	53	(52.0)	78
Commercial/instrument/multiengine	77	(75.5)	49	(48.0)	126
Total	102		102		204
					χ^2 = 16.27 [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total.

[a] $\chi^2(1, \underline{N} = 102) = 16.27, \underline{p} < .05$

Table 5
Hiring Criterion and Turbine Experience

Hiring Criterion / Turbine Experience	Availability of Entry-Level Pilots				Total
	Shortage		No-Shortage		
Required	17	(16.7)	40	(39.2)	57
Not Required	85	(83.3)	62	(60.8)	147
Total	102		102		204
					χ^2 = 12.88 [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total.

[a] $\chi^2(1, \underline{N} = 102) = 12.88, \underline{p} < .05$

to the relationship between the availability of entry-level airline pilots and the hiring criterion total time/hours, required by regional airlines of new-hire pilots. A calculated χ^2 value of (3, N = 102) = 17.37 was determined for these data. For df = 3, a χ^2 = 7.82 is required for significance at .05 level. Since 17.37 is > 7.82, for df = 3, p < .05, the null hypothesis was rejected.

The calculated χ^2 value for the data in **Table 7**, with respect to the relationship between the availability of entry-level airline pilots and the hiring criterion education level, required by regional air-

Table 6
Hiring Criterion and Total Flight Time

Hiring Criterion	Availability of Entry-Level Pilots				
	Shortage		No-Shortage		Total
Total Time/Hours					
200-500	7	(6.7)	1	(1.0)	8
501-1000	9	(8.8)	6	(5.9)	15
1001-1500	43	(42.2)	24	(23.5)	67
Over 1500	43	(42.2)	71	(69.6)	114
Total	102		103		204
					χ^2 = 17.37 [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total, because of rounding they may not total 100 percent.

[a] $\chi^2(3, N = 102) = 17.37, p < .05$

Table 7
Hiring Criteria and Education Level

Hiring Criterion	Availability of Entry-Level Pilots				
	Shortage		No-Shortage		Total
Education Level					
Bachelor's Degree or Above	1	(1.0)	13	(12.7)	14
Some College	28	(27.5)	34	(33.3)	62
High School or GED	60	(58.9)	49	(48.0)	109
Is not considered	13	(12.7)	6	(5.9)	19
Total	102		102		204
					χ^2 = 14.56 [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total. Because of rounding they may not equal 100 percent.

[a] $\chi^2(3, N = 102) = 14.56, p < .05$

lines of new-hire pilots, was (3, N = 102) = 14.56. Since 14.56 is > 7.82, for df = 3, p < .05, the null hypothesis was rejected.

The null hypothesis was not rejected with respect to the data tested in **Table 8.** The χ^2 value for the data was (1, N = 102) = 3.19, and 3.19 is < 3.84, for df = 1, p > .05. The data in **Table 8** show the relationship between the availability of entry-level airline pilots and the hiring criterion visual acuity, required by regional airlines of new-hire pilots.

The hiring criterion in **Table 9** is class of flight physical exam. The data in **Table 9** show the relationship between the availability of entry-level airline pilots and class of flight physical exam required by regional airlines of new-hire pilots. The calculated χ^2 value for the data was (1, N = 102) = 0.78. Since 0.78 is < 3.84, for df = 1, p >

Table 8
Hiring Criteria and Visual Acuity

Hiring Criterion / Visual Acuity	Availability of Entry-Level Pilots: Shortage		No-shortage		Total
20/20 Uncorrected	3	(2.9)	9	(8.8)	12
20/20 Corrected	99	(97.1)	93	(91.2)	192
Total	102		102		204
					$\chi^2 = 3.19$ [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total.

[a] $\chi^2(1, N = 102) = 3.19, p > .05$

Table 9
Hiring Criteria and Class of Flight Physical

Hiring Criterion / Flight Physical Exam	Availability of Entry-Level Pilots: Shortage		No-Shortage		Total
First Class	64	(62.7)	70	(68.6)	134
Second Class	38	(37.3)	32	(31.4)	70
Total	102		102		204
					$\chi^2 = 0.78$ [a]

Note: Numbers in ( ) are cell-percentages with respect to their column total.

[a] $\chi^2(1, N = 102) = 0.78, p > .05$

.05, the null hypothesis was not rejected.

Findings

The null hypotheses were rejected for four of the six regional airlines' hiring criteria used in this study, with respect to availability of proficient entry-level pilots. They were (a) certificates and ratings, (b) turbine experience, (c) total time/hours, and (d) education level.

Three of these hiring criteria--(a) certificates and ratings, (b) turbine experience, and (c) total time/hours--can be used to help determine an entry-level pilot's level of training. In each case the required level of training increased from an assumed shortage condition of proficient entry-level pilots to an assumed no-shortage condition of proficient entry-level pilots.

The data in **Table 4** show that under the hiring criterion certificates and ratings the level airline transport pilot increased from 24.5 percent to 52 percent, a difference of 27.5 percent. The amount of increase in the level required (**Table 5**) under the hiring criterion turbine experience was 22.5 percent, and that over 1500 (**Table 6**) under the hiring criterion total time/hours increased 27.4 percent. The increases occurred from an assumed shortage condition to an assumed no-shortage condition of proficient entry-level pilots. Hence, as the availability of proficient pilots increased or decreased, these hiring criteria levels also increased or decreased.

In respect to the hiring criterion education level, the data in Table 7 show that the desire for 2 levels, bachelor's degree or above and some college, both increased as the availability of proficient entry-level pilots increased. The increases were 11.7 percent and 5.8 percent respectively. For this same condition, the other two levels--high school or GED is not considered--both decreased.

Two hiring criteria where the null hypotheses could not be rejected were (a) visual acuity, and (b) class of flight physical exam. Between shortage condition of proficient entry-level airline pilots and no-shortage condition, the visual acuity level 20/20 uncorrected apparent increases were not found to be significant (**Table 8**).

Under the hiring criterion first class flight physical exam, the apparent increase of 5.9 percent in the level first, also was found to be insignificant (**Table 9**). These two hiring criteria are soft pilot requirements and do not affect an individual's flying ability.

CONCLUSIONS

It was found that, as the assumed availability of proficient entry-level pilots decreased, the hiring criteria used to determine the entry-level pilots required level of training by regional airlines also decreased. The decreases were significant with respect to four of the six hiring criteria used in this study. It is concluded that the four hiring criteria affected by training are relaxed somewhat with a declining availability of proficient entry-level airline pilots for most regional airlines.□

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