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Report*

The Biographical Inventory in Naval Aviation Selection: Inside the Black Box

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Abstract

A biographical inventory has been used in the selection of students for naval aviation training since World War II, and its validity in predicting their retention-attrition in this training has been well established. This study investigated the constructs underlying the inventory and their relations to students' retention-attrition. A factor analysis of the items on the inventory for student pilots identified five factors. One factor, being a commissioned officer, appeared to account for the inventory's validity.

Key words: Biographical inventory, naval aviation, pilots, selection, validity

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The Biographical Inventory in the Navy's aviation selection battery is interesting from both historical and psychometric perspectives. This inventory has been used continuously from World War II to the present to select aviators and other flight personnel (Frank & Baisden, 1994). Its only clear rival for longevity appears to be the Aptitude Index, the biographical inventory used by the Life Insurance Management Research Association since 1938 in selecting salespeople (Thayer, 1977).

The Navy's device, a traditional biographical inventory composed of heterogeneous items selected and keyed to predict the retention of students in aviation training, has evolved over the years, but can be traced back to an inventory developed by the Civil Aeronautics Administration before World War II (Viteles, 1945). The World War II form of the Navy's inventory (Fiske, 1947), interim forms in the 1950s and 1960s (Ambler, 1955), and the 1971 form (Brown, 1989) were keyed to predict the retention of student naval aviators (i.e., pilots), though they were also used with student naval flight officers (i.e., navigators, radar intercept officers, and other nonpilot aviation officer specialists). The current form, used since 1992, has separate keys for student naval aviators and student naval flight officers (Frank & Baisden, 1993).

The inventory's validity in predicting retention in naval aviation training is well established (often overshadowing other tests in the battery) for (a) aviators with the World War II form (Fiske, 1947), the 1950s and 1960s forms (e.g., Shoenberger, Wherry, & Berkshire, 1963), and the current form (e.g., Frank & Baisden, 1993); and (b) for flight officers with the 1950s and 1960s forms (e.g., Peterson, Booth, Lane, & Ambler, 1967), the 1971 form (Hopson, Griffin, Lane, & Ambler, 1978), and the current form (e.g., Frank & Baisden, 1993).

Despite the inventory's long use, little is known about the constructs it measures or the reasons for its success. It has been speculated that the inventory taps independence and risk taking (Ambler, Bair, & Wherry, 1960). And two factor analyses of the items on the current form of the inventory, many of which are not on its Student Naval Aviator and Student Naval Flight Officer keys, identified risk taking and several other factors, including science/engineering interest, athletics/sports, and military orientation (Biggerstaff, 1998; Street & Dolgin, 1992).

Accordingly, the purpose of this study was to identify the dimensions underlying the items on the long-used key for student naval aviators and the relations of these dimensions with retention of these students in naval aviation training.

Method

Sample

The sample consisted of all student naval aviators ($N = 1,819$) who applied for aviation training in 1986–1988, subsequently began the training program lasting as much as 8 months, and had complete data on the selection battery (the Navy and Marine Corps Aviation Selection Test, the 1971 form used until 1992; Brown, 1989) and the training retention criteria. The trainees consisted of 936 officers and 883 aviation officer candidates who would be commissioned upon completing Naval Aviation Schools Command,¹ the ground-school stage of training described below.

These students were selected largely on the basis of their performance on the test battery and a physical examination. The Aviation Qualification Test score (a general ability test) and the Flight Aptitude Rating, a composite score, were used in the selection. The Flight Aptitude Rating is based on the other tests in the battery: the Mechanical Comprehension Test, the Spatial Apperception Test (a spatial orientation measure), the Aerospace Information Test, and the Student Naval Aviator score (from the Biographical Inventory). A Biographical Inventory score, a composite based on the Student Naval Aviator score and the Aerospace Information Test, is also reported.

Variables

The variables were:

1. The items on the Student Naval Aviator key: 11 of the 67 items were excluded because they were experimentally or logically dependent on other items on the key.² Items were scored dichotomously (0 or 1, 0 or -1, 1 or -1) or trichotomously (1, 0, -1).³
2. The remaining tests in the battery, the Flight Aptitude Rating, and the Biographical Inventory composite score. Stanine scores were used for all tests, the Flight Aptitude Rating, and the Biographical Inventory composite score.⁴
3. Retention (1) vs. attrition (0) at the end of Naval Aviation Schools Command (excluding attrition for “nonpejorative” reasons, e.g., not physically qualified). Naval Aviation Schools Command consists of classroom work that focuses on aerodynamics, basic engine properties, and navigation, and lasts about six weeks.

Trainees who are not already officers must first complete military training at the Aviation Officer Candidate School, which lasts 13 weeks.

4. Retention (1) vs. attrition (0) at the end of Primary Flight Training, the first stage of flight training (excluding attrition for nonpejorative reasons). This standard definition of attrition vs. retention, used in previous research (e.g., Hopson et al., 1978), is cumulative and includes attrition at the earlier, Naval Aviation Schools Command stage. Primary Flight Training lasts about 4 months and includes coursework on specific aircraft systems, flight simulator sessions, and actual flight time.

Analysis

Product-moment correlations were computed between the 56 items from the Student Naval Aviator key, and a principal-axis factor analysis of the 56 items was carried out.

Several independent methods for determining the number of factors were used because of the frequent lack of consensus among them (Carroll, 1985). Each method was applied to the 56-item intercorrelation matrices for two random halves of the sample to assess the replicability of their results in view of the instability of factor analyses of items (Gorsuch, 1974). The methods were: (a) a scree test of eigenvalues based on a principal-axis factor analysis with squared multiple correlations as communality estimates (Cattell, 1966); (b) parallel analysis of random data for a principal-axis factor analysis with squared multiple correlations as communality estimates (Montanelli & Humphreys, 1976); (c) consistent salient loadings in the two halves for principal-axis factor analyses with squared multiple correlations as communality estimates and Varimax (Kaiser, 1958) rotations, the analyses done for varying numbers of factors (Carroll, 1985); and (d) comparability coefficients based on factor scores (computed by the multiple-regression method) for principal-axis factor analyses with iterated communality estimates and Varimax and Promax rotations (Hendrickson & White, 1964) for the two halves, the factor analyses done for varying numbers of factors (Everett, 1983).

The number of factors determined on the basis of these methods was used in the main analysis for the total sample. Factors were iterated and rotated by the Promax procedure.

Factor scores (computed by the multiple-regression method) were obtained, and the intercorrelations of the factor scores, the tests in the battery, Flight Aptitude Rating, Biographical Inventory composite score, and the retention criteria were calculated. Both statistical and

practical significance were considered in evaluating the correlations. For statistical significance, an .05 alpha level was used. For practical significance, an r of .10 was used, representing Cohen's (1988) definition of a "small" effect size. The assessment of practical significance is especially important because of the large sample involved (Cohen, 1994).

Results

Retention Criteria

Naval Aviation Schools Command. Ninety-one percent (91.1%; $N = 1,657$) of the student naval aviators were retained at the end of Naval Aviation Schools Command. The number of students attriting for various reasons appears in Table 1. Of the 162 students who attrited, the most common reason was Drop on Request ($N = 132$), a voluntary withdrawal.

Table 1

Reasons for Attrition in Naval Aviation Schools Command

Reason	Frequency ($N = 162$)
Drop on request	132
Academic failure	16
Not officer material	9
Physical training failure	5

Primary Flight Training. Seventy-eight percent (77.8%; $N = 1,415$) of the students were retained at the end of Primary Flight Training. The number of students attriting for various reasons in the Primary Flight Training stage are reported in Table 2. Of the 242 students who attrited in this stage, the most common reasons were Not Aviation Material ($N = 101$) and Pilot Flying Failure ($N = 82$).

Table 2

Reasons for Attrition in Primary Flight Training

Reason	Frequency (<i>N</i> = 242)
Not aviation material	101
Pilot flying failure	82
Academic failure	6
Not officer material	3
Other	50

Factors

Five factors were identified from a consensus of the results for the several methods used: (a) both scree tests showed two breaks in the eigenvalues—one break indicating four or five factors and the other indicating nine or ten factors, (b) the eigenvalues in the parallel analysis of random data were consistently smaller than the actual values and hence unusable, (c) at least two consistent salient loadings occurred for four and five factors, and (d) all comparability coefficients were above .8 for factor scores derived from the five-factor solution with Varimax and Promax rotations.

The items with salient loadings on the obliquely rotated factors appear in Table 3.⁵ Factor I appears to be Commissioned Officer; II, Science and Engineering Interests; III, Flight Experience; IV, Masculine Activities; and V, School Athletics.

The intercorrelations of the factors are reported in Table 4. The factors correlated no more than slightly with each other: The highest correlation was .26 between Factor I, Commissioned Officer and Factor V, School Athletics.

Table 3***Factors and Salient Items***

	Factor	Number of items ^a	Salient item (Paraphrased)	Structure coefficient ^b
I.	Commissioned Officer	5	Attended a service academy	.90
II.	Science and Engineering Interests	7	Majored in engineering	.61
III.	Flight Experience	2	Has a pilot license	.84
IV.	Masculine Activities	6	Repaired a household appliance	.38
V.	School Athletics	3	Member of a school athletic team	.49

^aItems with structure coefficients of $\pm .30$ or more. No items had structure coefficients of this size on more than one factor. ^bThis is the correlation of the item with the factor.

Table 4***Intercorrelations of Factors***

	Factor	(1)	(2)	(3)	(4)	(5)
(1)	I: Commissioned Officer	-	.07	-.22	-.21	.26
(2)	II: Science and Engineering Interests	.07	-	.03	.01	.01
(3)	III: Flight Experience	-.22	.03	-	.13	-.14
(4)	IV: Masculine Activities	-.21	.01	.13	-	-.10
(5)	V: School Athletics	.26	.01	-.14	-.10	-

Correlations of Factors With Test Battery

The correlations of the factor scores with the test battery appear in Table 5. All of the correlations with the Student Naval Aviator Score were statistically and practically significant. II: Science and Engineering Interests correlated highly with this score, .59; and IV: Masculine Activities correlated moderately with this score, .47. The other factors correlated slightly with this score. Note that these correlations are inflated by item overlap between the factor scores and the Student Naval Aviator score.

Some of the other correlations for the factor scores were also significant. Two factors, III: Flight Experience and I: Commissioned Officer, correlated moderately with the Aerospace Information Test, .39 and -.30, respectively. Three factors correlated moderately with the Biographical Inventory composite score: II: Science and Engineering Interests, .39; III: Flight Experience, .33; and IV: Masculine Activities, .46. And one factor, II: Science and Engineering Interests correlated moderately, .34, with the Flight Aptitude Rating. Note that these correlations with the Biographical Inventory composite score and the Flight Aptitude Rating are also inflated by item overlap between the factor scores and the Student Naval Aviator score, a component of both the Biographical Inventory composite score and the Flight Aptitude Rating.

Table 5***Correlations of Factor Scores with Test Battery***

Test battery	Factor				
	I. Commissioned Officer	II. Science and Engineering Interests	III. Flight Experience	IV. Masculine Activities	V. School Athletics
Aviation Qualification Test	<i>.13</i>	<i>.16</i>	<i>-.06</i>	<i>-.23</i>	<i>.08</i>
Mechanical Comprehension Test	<i>.02</i>	<i>.29</i>	<i>.08</i>	<i>.04</i>	<i>-.07</i>
Spatial Apperception Test	<i>-.03</i>	<i>.00</i>	<i>.06</i>	<i>-.01</i>	<i>-.07</i>
Student Naval Aviator Score	<i>.25</i>	<i>.59</i>	<i>.13</i>	<i>.47</i>	<i>.21</i>
Aerospace Information Test	<i>-.30</i>	<i>.08</i>	<i>.39</i>	<i>.23</i>	<i>-.28</i>
Biographical Inventory Composite Score	<i>-.08</i>	<i>.39</i>	<i>.33</i>	<i>.46</i>	<i>-.09</i>
Flight Aptitude Rating	<i>-.07</i>	<i>.34</i>	<i>.22</i>	<i>.27</i>	<i>-.11</i>

Note. Correlations that are both statistically ($p < .05$) and practically significant ($r > .10$) are in italics.

Correlations of Factors and Test Battery With Criteria

The correlations of the factor scores and the test battery with the criteria appear in Table 6. Some of the correlations for the factor scores were statistically and practically significant, but all were slight. Two factors correlated with the criteria: I: Commissioned Officer correlated .28 with Naval Aviation Schools Command retention and .21 with Primary Flight Training retention, and V: School Athletics correlated .14 with Naval Aviation Schools Command retention and .11 with Primary Flight Training retention.

Table 6

Correlations of Factor Scores and Test Battery With Retention Criteria

Variable	Retention criterion ^a	
	NASC ^b	PFT ^c
Factors		
I. Commissioned Officer	.28	.21
II. Science and Engineering Interests	-.01	.07
III. Flight Experience	-.06	.00
IV. Masculine Activities	-.02	.00
V. School Athletics	.14	.11
Test battery		
Aviation Qualification Test	-.02	.05
Mechanical Comprehension Test	.04	.13
Spatial Apperception Test	-.03	.05
Student Naval Aviator Score	.11	.14
Aerospace Information Test	-.05	-.02
Biographical Inventory Composite Score	.03	.06
Flight Aptitude Rating	.00	.10

Note. Correlations that are both statistically ($p < .05$) and practically significant ($r > .10$) are in italics.

^a Retention = 1, attrition = 0. ^b Naval Aviation Schools Command. ^c Primary Flight Training.

The test battery also had some significant but slight correlations with the criteria. The Student Naval Aviator score correlated with both, .11 with Schools Command retention and .14 with Primary School retention. The Mechanical Comprehension Test and Flight Aptitude Rating also correlated with Primary School retention, .13 and .10, respectively.

Discussion

An important finding is that the Biographical Inventory's Student Naval Aviator key measures several distinct factors. None of them is consistent with previous conjectures about the independence and risk taking content of the inventory (Ambler et al., 1960), though several are clearly congruent with factors identified in analyses of keyed and unkeyed items in the current (1991) form of the inventory: (a) Commissioned Officer with Commissioning Source (Biggerstaff, 1998); (b) Science and Engineering Interests with Interests in Math, Science, and Engineering (Street & Dolgin, 1992), Engineering (Biggerstaff, 1998), and Science, Non-Engineering (Biggerstaff, 1998)); and (c) School Athletics with Athletics (Biggerstaff, 1998).

Only one of the factors in this study was appreciably related ($r_s = .28, .21$) to retention in aviation training: Commissioned Officer. The association between this factor and retention is supported by previous findings of greater retention for ROTC and service academy graduates than for graduates of Officer Candidate School (see the review by Griffin & Mosko, 1977) and probably stems from differences in ability, motivation, and other characteristics between those who begin aviation training as officers and those who do not. Differences between these two kinds of students were observed previously (e.g., Wherry & Hutchins, 1964), with officers having higher Aviation Qualification Test scores and Student Naval Aviator scores. These differences persisted in the present study, as reflected in the modest correlation ($r = .13$) between the Commissioned Officer factor and the Aviation Qualification Test.

Although all of the student naval aviators were chosen largely on the basis of their performance on the selection battery, the officers had already been screened, explicitly and implicitly, during their earlier military training for the ability and motivation to be officers. By contrast, the screening of the aviation officer candidates for these qualities did not take place until the ground-school stage of training, resulting in a disproportionately greater attrition for these students at that point (Griffin & Mosko, 1977). Preexisting differences between the two groups of students may also persist during the flight school stage, producing greater retention for

officers during that stage, too. Indeed, the Commissioned Officer factor not only predicted retention at the end of ground school but also retention at the end of flight school. It would be useful to pinpoint the specific psychological variables that distinguish the groups in order to improve the understanding and prediction of retention, as recommended previously (Wherry & Hutchins, 1964).

It is noteworthy that the Commissioned Officer factor was a better predictor of retention than any test in the battery (including the Student Naval Aviator score), particularly retention at the end of ground school. The minimal validity of the other factors in predicting retention may seem to be an anomaly because all of the items on the Student Naval Aviator key were initially selected because of their ability to predict this criterion. But the items defining the Commissioned Officer factor may simply be more valid. Ironically, these other factors accounted for more of the variance in the Student Naval Aviator score than did the Commissioned Officer factor, and hence detracted from the score's validity.

The pattern of correlations between the factors and the battery, notably the appreciable correlations of the Flight Experience factor with the Aerospace Information Test ($r = .39$) and the Science and Engineering Interests factor with the Mechanical Comprehension Test ($r = .29$), supports the interpretation of the factors, but also raises a concern about the redundancy between what is being measured by the Student Naval Aviator score and the cognitive tests in the battery. Indeed, this score correlates appreciably with the Mechanical Comprehension Test ($r = .22$). Insofar as the Student Naval Aviator score and the tests are tapping the same things, it would be simpler and better to assess these characteristics with the tests and limit the Student Naval Aviator score to experiential, motivation, and similar variables that cannot be appraised in other ways, consistent with the strategy advocated in the Army Air Forces aviation program in World War II (Mock, 1947). A greater focus on such variables might enhance the validity of the biographical measure and, in turn, the battery as a whole.

The extent to which the present results account for the biographical measures' validity in the past is not entirely certain, given the absence of precise details about the content of earlier versions of this device. The Commissioned Officer factor that emerged in this study of a combined sample of officers and officer candidates clearly cannot explain the biographical measure's validity in the earlier investigations that used samples either of officers or of officer candidates and aviation cadets (e.g., Shoenberger et al., 1963). It is conceivable that the School

Athletics factor, which had modest validity in the present study, contributed to the measure's effectiveness in predicting retention in training.

It is highly likely that the present findings, though based on the previous battery, apply to the current one, for the two are very similar, and most of the items in the previous Student Naval Aviator key have been carried over to the Student Naval Aviator and Student Naval Flight Officer keys in the current Biographical Inventory.

From a broader perspective, the present results underscore the desirability of identifying the dimensions underlying heterogeneous biographical inventories in order to understand the functioning of these devices and to develop new measures with optimal characteristics. This viewpoint is consistent with the growing realization of the need for construct-oriented biographical inventories (e.g., Mumford & Owens, 1987).

References

- Ambler, R. K. (1955). *Characteristics of the revised Aviation Selection Test Battery administered experimentally to naval aviation cadets* (NSAM Rep. No. 235). Pensacola, FL: Naval School of Aviation Medicine.
- Ambler, R. K., Bair, J. T., & Wherry, R. J., Jr. (1960). Factorial structure and validity of naval aviation selector variables. *Aerospace Medicine*, *31*, 456–461.
- Biggerstaff, S. (1998). Factor analysis of the U.S. Navy's Aviation Interest subtest. *Proceedings of the 40th Annual Conference of the International Military Testing Association*, *40*. (NTIS No. AD A362 220)
- Brown, D. C. (1989). Officer aptitude selection measures. In M. F. Wiskoff & G. M. Rampton (Eds.), *Military personnel measurement--Testing, assignment, evaluation* (pp. 97–127). New York: Praeger.
- Carroll, J. B. (1985). Exploratory factor analysis: A tutorial. In D. K. Detterman (Ed.), *Current topics in human intelligence: Vol. 1. Research methodology* (pp. 25–58). Norwood, NJ: Ablex.
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, *1*, 245–276.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum
- Cohen, J. (1994). The earth is round ($p < .05$). *American Psychologist*, *49*, 997–1003.
- Everett, J. E. (1983). Factor comparability as a means of determining the number of factors and their rotation. *Multivariate Behavioral Research*, *18*, 197–218.
- Fiske, D. W. (1947). Validation of naval aviation cadet selection tests against training criteria. *Psychological Bulletin*, *31*, 601–614.
- Frank, L. H., & Baisden, A. G. (1993). The 1992 Navy and Marine Corps Aviation Selection Test Battery development. *Proceedings of the 35th Annual Conference of the Military Testing Association*, *35*, 14–19.
- Gorsuch, R. L. (1974). *Factor analysis*. Philadelphia: Saunders.
- Griffin, G. R., & Mosko, J. D. (1977). *Naval aviation attrition 1950–1976: Implications for the development of future research and evaluation* (NAMRL Rep. No. 1237). Pensacola, FL: Naval Aerospace Medical Research Laboratory. (NTIS No. AD A046 212)

- Hendrickson, A. E., & White, P. O. (1964). Promax: A quick method for rotation to oblique simple structure. *British Journal of Statistical Psychology*, 17, 65-70.
- Hopson, J. A., Griffin, G. R., Lane, N. E., & Ambler, R. K. (1978). *Development and evaluation of a naval flight officer scoring key for the naval aviation biographical inventory* (NAMRL Rep. No. 1256). Pensacola, FL: Naval Aerospace Medical Research Laboratory. (NTIS No. AD A141 523)
- Kaiser, H. F. (1958). The varimax criterion for analytic rotation in factor analysis. *Psychometrika*, 23, 187–200.
- Mock, S. J. (1947). Biographical data. In J. P. Guilford (Ed.), *Printed classification tests* (Army Air Forces Aviation Psychology Program Research Rep. No. 5, pp. 767–795). Washington, DC: Government Printing Office.
- Montanelli, R. G., Jr., & Humphreys, L. G. (1976). Latent roots of random data correlation matrices with squared multiple correlations on the diagonal: A Monte Carlo study. *Psychometrika*, 41, 341–348.
- Mumford, M. D., & Owens, W. A. (1987). Methodology review: Principles, procedures, and findings in the application of background data measures. *Applied Psychological Measurement*, 11, 1–31.
- Peterson, F. E., Booth, R. F., Lane, N. E., & Ambler, R. K. (1967). *Predicting success in naval flight officer training* (NAMI Rep. No. 996). Pensacola, FL: Naval Aerospace Medical Institute. (NTIS No. AD 650 364)
- Shoenberger, R. W., Wherry, R. J., Jr., & Berkshire J. R. (1963). *Predicting success in aviation training* (NSAM Rep. No. 873). Pensacola FL: Naval School of Aviation Medicine. (NTIS No. AD 426 143)
- Street, D. R., Jr., & Dolgin, D. L. (1992). *The efficacy of biographical inventory data in predicting early attrition in naval aviation officer candidate training* (NAMRL Rep. No. 1373). Pensacola, FL: Naval Aerospace Medical Research Laboratory. (NTIS No. AD A258 025)
- Thayer, P. W. (1977). “Somethings old, somethings new.” *Personnel Psychology*, 30, 513–524.
- Viteles, M. R. (1945). The aircraft pilot: 5 years of research—A summary of outcomes. *Psychological Bulletin*, 42, 489–526.

Wherry, R. J., Jr., & Hutchins, C. W., Jr. (1964). *An investigation of unpredicted differences in attrition rates among students from different procurement sources* (NSAM Rep. No. 907). Pensacola, FL: Naval School of Aviation Medicine. (NTIS No. AD 609 668)

Notes

¹ Now called Aviation Preflight Indoctrination.

² An example of experimentally dependent items: An initial item about whether a parent engages in a certain activity is inapplicable; a follow-up item about this activity must also be inapplicable. An example of logically dependent items: One item is about which activities are preferred; the other item is about which of these same activities are not preferred.

³ Hypothetical items (adapted from Mumford & Owens, 1987) resembling those on the Biographical Inventory and their scoring (in brackets) follow. (Hypothetical items are used to protect the security of the current Biographical Inventory.)

What is your marital status?

[1] a. Single

[0] b. Married

[0] c. Widowed

[-1] d. Separated or divorced

Which of the following have you suffered from in the last year?

Yes [0] No [1] a. Allergies

Yes [0] No [1] b. Asthma

Yes [0] No [1] c. Gastrointestinal upsets

⁴ Stanine scores for the Mechanical Comprehension Test and the Spatial Apperception Test were obtained from the “half” stanines usually reported for these tests. Half stanine scores divide each stanine into halves (e.g., the original stanine 1 with 4% of the distribution becomes half stanines 1 and 2, each with 2% of the distribution), except for stanine 9, which is divided into thirds (original stanine 9 with 4% of the distribution becomes half stanines 17, 18, and 19, each with 1.3% of the distribution). Stanine scores for the Aerospace Information Test and the Student Naval Aviator key were calculated from raw scores for 1983 applicants for naval aviation training ($N = 22,584$).

⁵ Only a single, paraphrased item per factor is reported for security reasons.