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RESEARCH REPORT SRR 73-5

AUGUST 1972

**THE STRONG VOCATIONAL INTEREST BLANK AS A PREDICTOR
OF RETENTION IN THE NOAA OFFICER CORPS**

**Idell Neumann
Norman M. Abrahams**

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THE STRONG VOCATIONAL INTEREST BLANK AS A PREDICTOR
OF RETENTION IN THE NOAA OFFICER CORPS

Idell Neumann
Norman M. Abrahams

August 1972

Research Report SRR 73-5

Prepared for

National Oceanic and Atmospheric Administration
Department of Commerce
Under Number E-615-71

Submitted by

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Naval Personnel and Training Research Laboratory
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SUMMARY

A. Problem

The retention rate of National Oceanic and Atmospheric Administration (NOAA) officers is somewhat lower than desired for the efficiency of the organization.

B. Background

The present study was undertaken by the Naval Personnel and Training Research Laboratory, San Diego (NPTRLSD) in response to a request for assistance from NOAA. This Laboratory has successfully completed similar efforts, using the Strong Vocational Interest Blank (SVIB), in improving the selection of career motivated naval officers.

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The SVIB and a background questionnaire (BQ) were administered to samples of retired, resigned, and active duty NOAA officers. The BQ responses were used to identify low tenure active duty officers who had not yet reached the career decision point. An empirical tenure scale was constructed by contrasting the SVIB responses of a portion of the high and low tenure officers. This scale was subsequently cross-validated on the remaining sample. In addition, the mean scores for the high and low tenure officers were obtained for each of the 56 standard occupational interest scales to construct and compare occupational profiles.

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Cross-validated correlation coefficients ranging from .50 to .65 lead to the recommendation that the SVIB be integrated into the present procedures for selecting NOAA officers.



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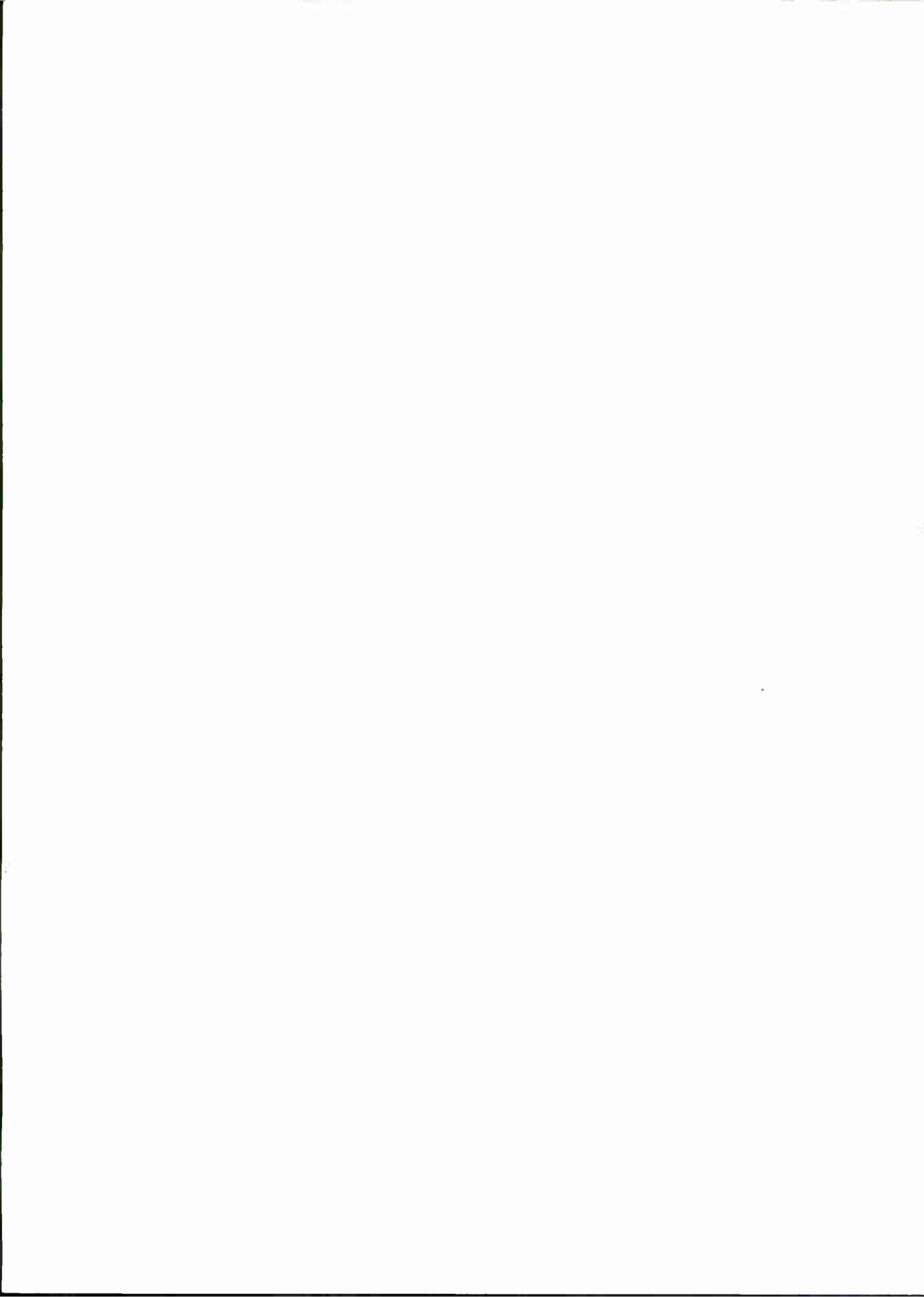
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THE STRONG VOCATIONAL INTEREST BLANK AS A PREDICTOR
OF RETENTION IN THE NOAA OFFICER CORPS

A. BACKGROUND AND PURPOSE

In both government and private industry, the loss of trained personnel early in their careers is costly not only in direct training expenses but also in the inevitably reduced efficiency of a work group during the break-in period for new personnel. As with other branches of the uniformed services, the National Oceanic and Atmospheric Administration (NOAA) Officer Corps of the U. S. Department of Commerce has experienced a lower retention rate of its junior officers than is desired for the efficiency of the organization.

Interest inventories have been well established as predictors of job tenure. For the past several years the Naval Personnel and Training Research Laboratory, San Diego, has conducted a number of studies on the use of interest tests in predicting tenure of military personnel, including several officer programs (e.g., Abrahams & Neumann, 1971; Neumann & Abrahams, 1970). While some studies (Boyd, 1961; MacKinney & Wolins, 1960; Robbins & King, 1961) indicate that the standard existing scales on the Strong Vocational Interest Blank (SVIB) predict tenure for certain occupations, generally, scales constructed for specific groups are superior (e.g., Abrahams, Neumann, & Dann, 1969). The present study was undertaken in response to a request by NOAA for assistance in improving the retention of NOAA officers.

B. PROCEDURE

1. Instruments

a. Strong Vocational Interest Blank (SVIB). The interest inventory used in this study, the 1966 edition of the SVIB, contains 399 items covering preferences for occupations, school subjects, amusements, activities, and types of people, as well as self-ratings of abilities and characteristics. Most of the items require a "Like," "Indifferent," or "Dislike" response, providing a total of 1,197 possible item responses.

b. Background questionnaire (BQ). A 10-item questionnaire was devised to obtain supplemental information (see the Appendix). Two direct questions of career intention were supplemented by items which were previously shown to be related to retention of NOAA officers (Rushing, 1971).

2. Population

During the summer and early fall of 1971, the SVIB and BQ, with instructions for self-administration, were mailed to all active duty

and retired officers. Testing materials were also mailed to officers who had resigned within the previous three or four years and for whom current mailing addresses were available. Completed answer sheets were received for 215 active duty officers, 70 retired officers, and 87 resigned officers.

3. Development of the Retention Scale

a. General method for empirical scale construction. The basic method in constructing a scale from an interest inventory to differentiate two groups such as high and low tenure personnel, involves first identifying the items that are answered differently by individuals in the two groups. Such items are identified by computing the proportion of individuals in each group selecting each item choice. Response proportions for the two groups are then compared and those item responses differing by a previously specified minimum are included in the scale.

Table 1, which presents hypothetical data to illustrate the item analysis procedure, indicates that 60 per cent of the high tenure officers responded "Like" to this item, while only 40 per cent of the low tenure officers selected this choice. If the minimum difference established for scale inclusion were 20 per cent, the response "Like" would be included in the scoring key. Furthermore, it would be given a scoring weight of +1 since the high tenure officers endorsed it more often. Similarly, the "Dislike" response was selected by 25 per cent more low tenure officers and would thus be assigned a scoring weight of -1. In this way all items are evaluated and those revealing the greatest differences are included in the key. (In some cases +2 and +3 weights are used, but research has shown such differential weighting to contribute little to test validity.)

TABLE 1
Response Percentages for a Hypothetical
Interest Test Item

Response	High Tenure	Low Tenure	% Difference Between High & Low Tenure
Like	60	40	+20
Indifferent	35	30	+ 5
Dislike	5	30	-25

b. Criterion groups. It was first necessary to determine the tenure status for each NOAA officer who completed an SVIB. There was no problem, of course, with the retired officer sample (N=70)-- they were obviously high tenure. Similarly, the active duty officers with the rank of LCDR or higher (N=71) were considered high tenure. The resigned officers, except for six, had served less than four years beyond their minimum obligated time prior to their resignation and were thus considered low tenure. This determination provided a total of 141 high tenure officers and 81 low tenure officers with obvious status, leaving 144 active duty officers (Ensigns, LTJGs, and LTs) with unclear status.

Since 81 low tenure officers were not considered sufficient for constructing an SVIB scale, it was necessary to attempt to identify the active duty officers who would eventually resign before serving long enough to be classified as high tenure officers. Previous research on Navy samples (e.g., Proctor, 1963) has indicated that negative career statements obtained close to the time of making a career decision are highly accurate. Of the 144 unclassified active duty officers, 54 Ensigns and LTJGs were classified as low tenure, since they were close to the decision point and had indicated they planned to leave the Corps shortly. Additional information was used to determine the tenure status of the remaining 90 officers. A career-intention scale was constructed of the remaining BQ items.¹ Of the remaining 90 officers, 24 responded negatively to the career intention items and also scored at the low end of the BQ scale (as did the 54 previously designated low tenure officers). The 24 additional officers were added to the low tenure sample.

4. Standard Occupational Interest Scales

In addition to the development and evaluation of the special scale, as described above, the high and low tenure groups were scored on the 56 standard occupational interest scales which are widely used for vocational guidance. Scores on these scales indicate how similar a person's interests are to those of each occupational group. To determine if the high and low tenure groups differ from each other, mean scores for each group were computed for each of the occupational scales. These mean scores were used to construct occupational profiles of typical high tenure and low tenure NOAA officers.

¹The BQ was constructed on groups of known high and low tenure status and scored such that a low score is indicative of low tenure.

C. RESULTS AND DISCUSSION

1. Occupational Interest Scale Profiles

Figure 1 presents the mean occupational interest score profiles for both the high and low tenure officers. The 12 scales showing the largest differences, taking variance into account, are identified by a (+) or (-) sign in Figure 1. In general, the high tenure officers indicate greater interest in business-oriented occupations, such as accountant and purchasing agent, and those emphasizing technical or mechanical interests, such as production manager and engineer. On the other hand, while the mean scores for neither group are particularly high in the area of social service, such as social worker and YMCA secretary, the low tenure officers score higher on several such scales.

2. Retention Scale

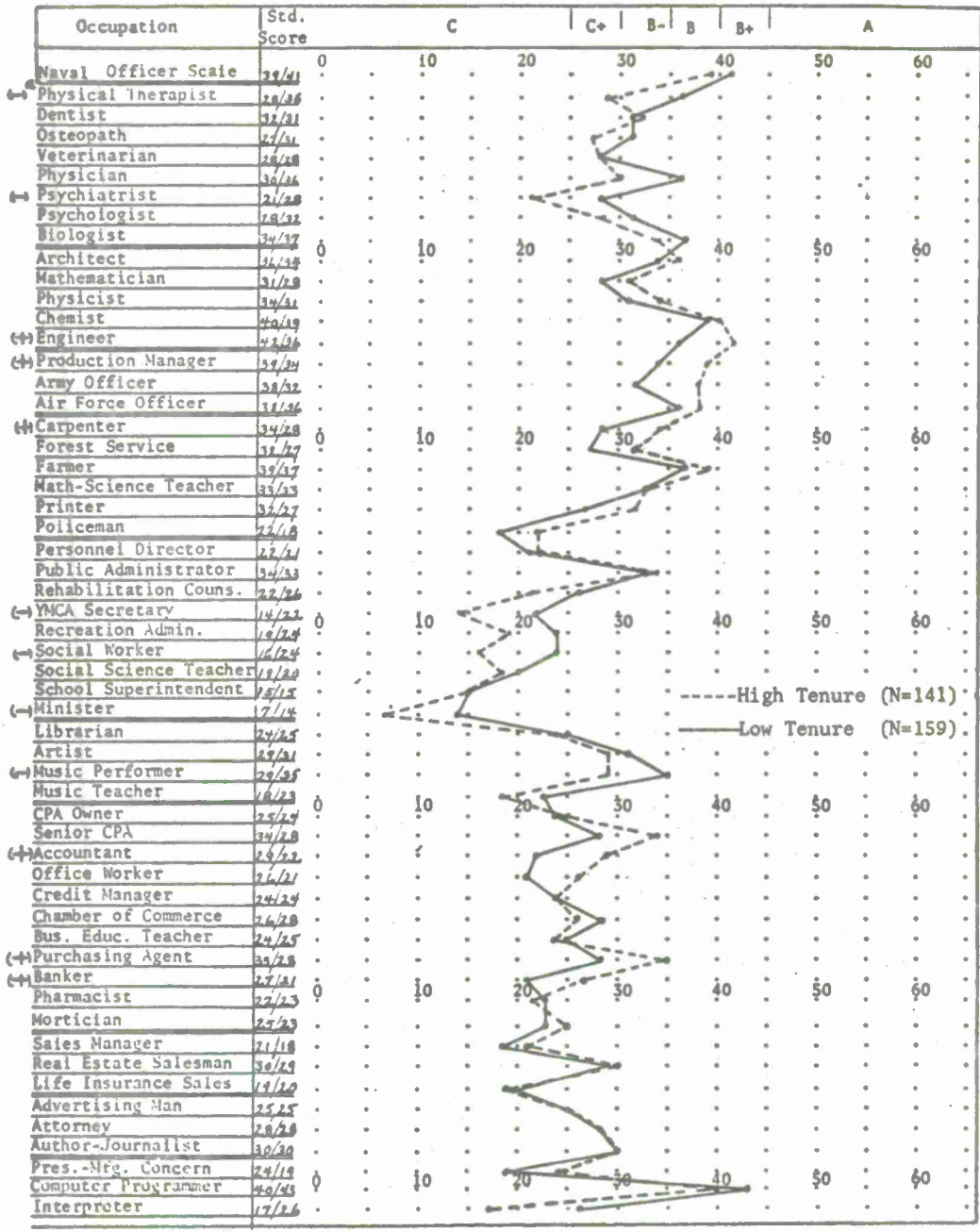
The high and low tenure groups were each randomly divided into two groups. The key-development sample consisted of two-thirds of each group. The cross-validation sample consisted of the other third. Contrasting the SVIB responses of the key-development high and low tenure groups, the 75 item responses with the largest percent differences were selected for inclusion in a retention scale which will be referred to as K-1.

The scale items were examined to identify the characteristics (i.e., item clusters) that differentiate the high and low tenure officers. Seven item response clusters were identified from the NOAA tenure scale, each containing from 4-7 items (Table 2). In general, high tenure officers more frequently endorse items that point to a somewhat conservative outlook on life. They seem to prefer systematic work and military activities more than low tenure officers. Even though the majority of high and low tenure officers tend to like outdoor activities such as "camping out," "skiing," and "picnics," the high tenure officers like them less. Similarly, while neither group indicates a high absolute level of preference for cultural-aesthetic activities, the career motivated officers select such activities less frequently. The career motivated officers endorse items reflecting non-conformity and psychological or social service activities less often than low tenure officers. These differences should not be interpreted to indicate that either the high or low tenure group is uniformly composed of officers with these interest preferences. Thus, it must be kept in mind that the differences are relative and not absolute.

To determine the scale's validity on an independent sample, the remaining one-third of each tenure group was scored on Scale K-1. As can be seen from Table 3, a highly significant point-biserial correlation of .67 was obtained for Scale K-1.

Since the range in age varied considerably from the Ensigns or Lieutenants (junior grade) included in the low tenure sample to the retired officers in the high tenure sample, it was possible that the

PROFILE FOR STRONG VOCATIONAL INTEREST BLANK - FOR MEN



Note.--

^aThe signs in parentheses identify the 12 occupations where the largest differences occur between tenure groups. A "+" signifies that the high tenure officers score higher and a "-" indicates that the low tenure officers score higher.

Fig. 1. Mean occupational scale profiles for high and low tenure NOAA officers.

TABLE 2

Item Response Clusters Differentiating Between
High and Low Tenure NOAA Officers

High Tenure Officers Higher On	Low Tenure Officers Higher On
Conservatism	Outdoor Activities
Systematic Work	Cultural-Aesthetic Activities
Military Activities	Non-Conformity
	Psychological or Social Service Activities

TABLE 3

Means, Standard Deviations, and Validities of Tenure
Scales for Cross-validation Samples

Scale	Sample	N	\bar{X}	S.D.	r_{pb}
K-1 (75 item- responses)	High Tenure	47	109.34	7.69	.67**
	Low Tenure	53	94.91	8.25	
K-2 (64 item- responses)	High Tenure	47	106.57	6.74	.65**
	Low Tenure	53	94.34	7.45	

Note.--

** $r_{pb} \geq .26, p \leq .01.$

K-1 scale might merely be identifying age differences in the two samples, rather than differences in the level of career motivation. To check on this possibility and, at the same time, improve the scale so that it would be free of the age influence, the following procedure was employed. Campbell (1971) has developed an SVIB age-related interest scale for research purposes that consists of 162 item responses. When the items on the K-1 scale were compared with this age-related scale, 11 item responses were identified that were scored in the same direction on both scales. After eliminating these 11 item responses from the K-1 scale, scores were obtained for the cross-validation sample on the scale named K-2, consisting of the remaining 64 item responses. Since the validity of the K-2 scale dropped only slightly to .65, eliminating the age-related items hardly reduces the scale's effectiveness.

The cross-validation samples used above may suffer from two weaknesses. One of these is the extreme age range of subjects and the other is the inclusion of active duty officers who are judged to be low tenure. In order to correct for these deficiencies, the cross-validation samples were refined. All officers in the low tenure sample who were merely expected to leave NOAA soon were removed, leaving in the sample only those officers who had actually left. The extreme age range was reduced by removing the retired officers from the high tenure sample and leaving only active duty high tenure officers. In this way a more conservative validity estimate could be obtained against tenure on a sample having only the actual tenure criterion and less variability on age.

Although the validities of the scales shrink considerably with the removal of some of the extreme cases, the obtained correlation coefficients ($r_{pb} = .49$ or $.50$) are still sufficiently high for effective use in selection (see Table 4). Even though no differences in validity were found between scales K-1 and K-2, a scale with the age-related items eliminated seems better suited for operational use.

To illustrate the practical advantages of using the K-2 key for selection, an expectancy chart was prepared (Figure 2). On the basis of previous data, the retention rate may be assumed to be, at best, 25 per cent seven years after an officer is commissioned. Figure 2 indicates that if the applicants who are otherwise qualified are selected from those scoring on the top third of the scale only, the percentage of officers remaining on active duty for at least seven years will be increased to 57.7 per cent.

The total sample was previously divided into a key-construction and a cross-validation sample for the purpose of determining scale validity on a sample independent of the keying procedure. However, in constructing scales, the more cases used to determine each tenure group's response proportions, the more stable these proportions will

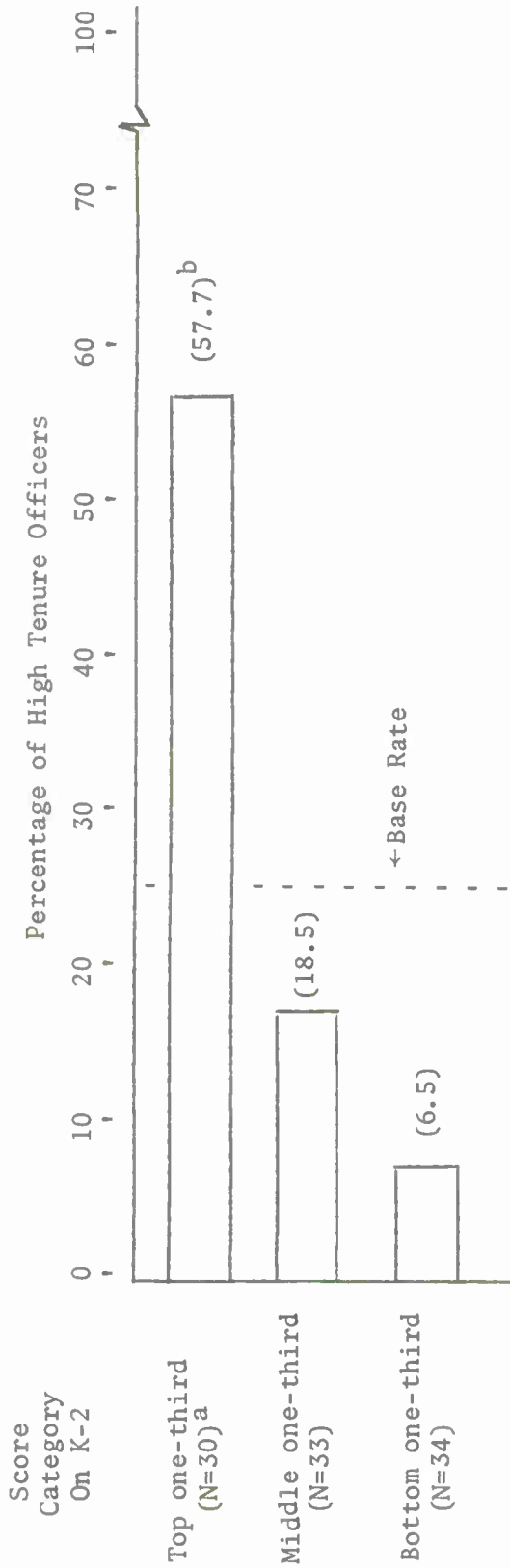
TABLE 4

Means, Standard Deviations, and Validities of Tenure Scales
for Cross-Validation Subsample Consisting of High
Tenure Active Duty and Resigned Officers

Scale	Subsample	N	\bar{X}	S.D.	r_{pb}
K-1 (75 item- responses)	High Tenure (Actives)	22	106.23	7.34	.49**
	Low Tenure (Resigned)	27	97.41	8.13	
- - - - -					
K-2 (64 item- responses)	High Tenure (Actives)	22	104.64	6.85	.50**
	Low Tenure (Resigned)	27	96.41	7.26	

Note.--

** $r_{pb} \geq .360$, $p \leq .01$.



Note.--

^aThe frequencies for the high and low tenure groups have been adjusted to reflect a retention rate of .25. It is assumed that this retention rate represents the proportion of high tenure officers on active duty seven years subsequent to commissioning.

^bNumbers in parentheses indicate the percentage of high tenure officers in each score category.

Fig. 2. Retention rates based on SVIB NOAA key K-2 applied to cross-validation sample of high tenure active duty officers and low tenure resigned officers.

be. Since it has been demonstrated that a highly predictive scale could be constructed from the SVIB item responses obtained from a sample of NOAA officers, it was decided to use the total sample in constructing the final scale for operational use. The previously designated key-construction and cross-validation samples were thus combined and the response proportions were determined for all the item responses separately, for both the high tenure and the low tenure officers. The 75 most valid item responses (excluding age-related items) were then selected for the final NOAA tenure scale.

Since an expectancy chart must be based on a sample independent of keying, it is not possible to present expectancy data for the final NOAA tenure scale. However, since scores on the final NOAA tenure scale and K-2 scores correlate .96 with each other and the K-2 scale provides an unbiased estimate of scale validity, the expectancy chart based on K-2 scores (Figure 2) may be assumed to represent a conservative estimate of the tenure scale's effectiveness.

D. CONCLUSIONS AND RECOMMENDATIONS

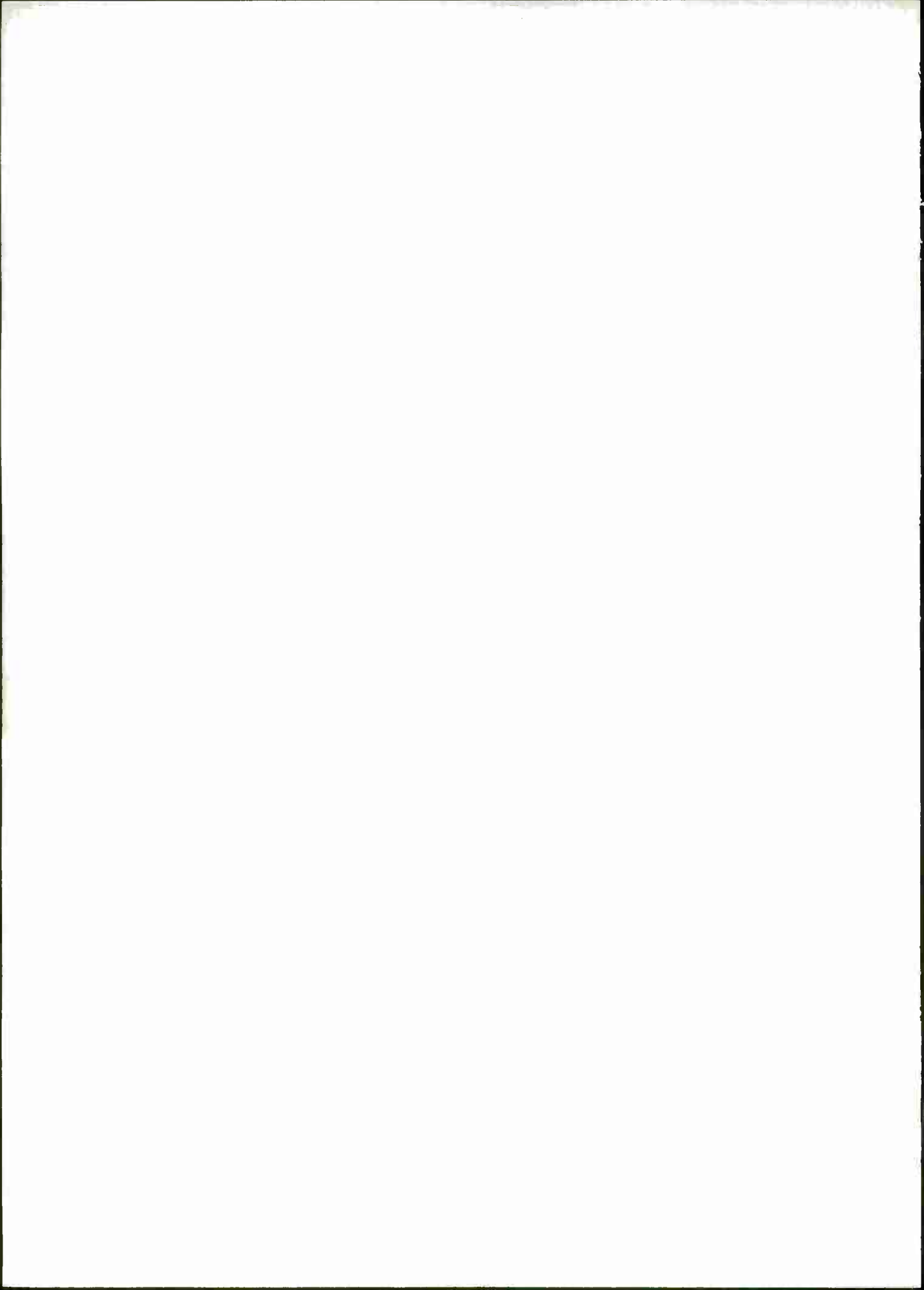
1. A number of the standard SVIB occupational interest scales successfully discriminate between high and low tenure NOAA officers, indicating that these two groups differ in their career interests. Further analyses, resulting in the construction and cross-validation of a highly predictive empirical scale presents additional favorable evidence for the potential use of the SVIB as a selection instrument.

2. Cross-validated correlation coefficients ranging from .50 to .65 were computed for the specially constructed NOAA officer tenure scale. This highly satisfactory finding leads to the recommendation that the SVIB be integrated into the present procedures for selecting NOAA officers.

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APPENDIX

BACKGROUND QUESTIONNAIRE

For each of the 10 questions below, select the one answer that best applies to you.

1. What do/did you consider to be your primary specialty within the NOAA disciplines?
- 0. Engineering (Mechanical, Civil, Electrical, etc.).
 - 1. Ships Officer.
 - 2. Hydrography.
 - 3. Oceanography.
 - 4. Management, Administration, Coordination, etc.
 - 5. Geodesy and/or Gravity.
 - 6. Seismology, Geophysics, and Physics.
 - 7. Photogrammetry.
 - 8. Meteorology.
 - 9. Other (Please specify _____).

2. Would you encourage a good friend who was qualified to make the Officer Corps a career?
- 0. Yes, I would encourage him strongly.
 - 1. Yes, I would encourage him.
 - 2. I would neither encourage him nor discourage him.
 - 3. I would discourage him from making it a career.
 - 4. I would strongly discourage him from making it a career.

3. What influence did the draft have on your decision to join NOAA?
- 0. Definitely would not have entered if no draft.
 - 1. Probably would not have entered if no draft.
 - 2. Probably would have entered even if no draft.
 - 3. Definitely would have entered even if no draft.
 - 4. Don't know what I would have done if no draft.
 - 5. Not applicable--not subject to the draft when I entered.

4. What is/was your wife's attitude (or immediate family if not married) toward your making the Commissioned Officer Corps a career?
- 0. Very much in favor of it.
 - 1. Somewhat in favor of it.
 - 2. Neutral.
 - 3. Somewhat opposed to it.
 - 4. Very much opposed to it.
 - 5. Do not know--she/they expressed no opinion about my career decision.
 - 6. Not applicable (no wife or immediate family).

Indicate the influence of each of the following three items on your feelings about making the Corps a career.

5. Amount of routine or monotonous work:
- 0. Very unfavorable.
 - 1. Unfavorable.
 - 2. Neutral.
 - 3. Favorable.
 - 4. Very favorable.
6. Pay:

- 0. Very unfavorable.
 - 1. Unfavorable.
 - 2. Neutral.
 - 3. Favorable.
 - 4. Very favorable.
7. Utilization of skills, abilities, and interests:
- 0. Very unfavorable.
 - 1. Unfavorable.
 - 2. Neutral.
 - 3. Favorable.
 - 4. Very favorable.

8. What are your plans regarding a career in the Commissioned Officer Corps?
0. Intend to make the Corps my career.
 1. Intend to remain beyond my obligation but not for a career.
 2. Intend to fulfill my obligation only.
 3. Undecided.
 4. Retired.
 5. Resigned.
9. If you have left or are planning to leave, which of the following BEST describes your reasons for leaving the Corps?
0. Personal treatment you received while in the Corps.
 1. Conditions of Corps service you experienced.
 2. Occupational/professional considerations.
 3. Educational considerations.
 4. Family separation and frequent moves.
 5. Plan to (or did) remain until retirement.
 6. Other (please specify _____).
10. To the best of your knowledge, how long, beyond the obligated service requirement, do you plan to (or did you actually) serve in NOAA?
0. Plan to leave at end of obligation.
 1. Between 1 and 6 months.
 2. Between 6 and 12 months.
 3. Between 12 and 18 months.
 4. Between 18 and 24 months.
 5. Between 2 and 3 years.
 6. Between 3 and 6 years.
 7. Between 6 and 10 years.
 8. Between 10 and 15 years.
 9. 15 or more years.

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