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**NAVAL PERSONNEL AND TRAINING  
RESEARCH LABORATORY**  
SAN DIEGO, CALIFORNIA 92152

RESEARCH REPORT SRR 71-13

MARCH 1971

**A COMPARISON OF RETENTION OF CATEGORY IVs  
AND NON-IVs IN FIFTY-EIGHT NAVY RATINGS**

Charles H. Cory

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A COMPARISON OF RETENTION OF CATEGORY IVs  
AND NON-IVs IN FIFTY-EIGHT NAVY RATINGS

Charles H. Cory

March 1971

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Research Report SRR 71-13

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Naval Personnel and Training Research Laboratory  
San Diego, California 92152

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## SUMMARY

### A. Problem

The advent of Project 100,000 made it especially important to determine the best means of utilizing Category IV men in the Navy. In particular it became important to learn which ratings were most suitable for these men in terms of retention. A related interest is whether IVs have generally higher retention rates than personnel in other mental levels.

### B. Approach

From a sample of approximately 19,500 Navy men enlisting between 1953 and 1965, the men retained through June 1967 were identified. After classifying these 3365 men by mental level, percentages of each mental level present in each rating were computed and were used to compare ratings in terms of their suitability for IVs. DOD occupational areas having the greatest retention problems were identified and consideration was given to determining which ratings in those areas might be most suitable for IVs.

### C. Findings

1. Category IV personnel were found to have been retained in 35 ratings, a substantially smaller number of ratings than those having Low-IIIs and High III-IIIs, but much higher than the number of ratings having Is (page 6).
2. An overall rate of retention of 18.1 percent was found for the sample. Retention rates for the different mental level groups ranged from 12.5 percent to 18.7 percent, with the rate for IVs being substantially lower than those for the other three groups (page 2).
3. Despite an overall lower than average retention rate, IVs had higher rates of retention for many ratings than other mental levels (pages 6 and 7).
4. Using the criterion of above average retention level, the 12 ratings for which Category IVs appear to be most suitable are Aviation Machinist's Mate (AD), Aviation Structural Mechanic (AM), Boilerman (BT), Machinist's Mate (MM), Ships Serviceman (SH), Steward (SD), Commissaryman (CS), Boatswain's Mate (BM), Gunner's Mate (GM), Engineman (EN), Shipfitter (SF), and Storekeeper (SK) (page 6).
5. Ratings for which IVs might also be suitable (in DOD occupational areas for which retention is a problem) are: Construction Mechanic (CM), Aviation Ordnanceman (AO), Aircrew Survival Equipmentman (PR), Aviation Boatswain's Mate (AB), Damage Controlman (DC), Equipment Operator (EO), and Builder (BU) (page 8).

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A COMPARISON OF RETENTION OF CATEGORY IVs  
AND NON-IVs IN FIFTY-EIGHT NAVY RATINGS

A. PURPOSE

This study was undertaken to investigate certain aspects of retention of career Category IVs (IVs) in the various Navy occupation specialities during the period immediately prior to the initiation of Project 100,000 in order (1) to identify the ratings for which IVs appear to have been best suited, and (2) to compare IVs and non-IVs in terms of their long term retention in specific ratings.

B. PROCEDURE

1. Sample

Data for about 20,000 men entering the Navy between 1953 and 1965 were obtained from records on file at the Naval Personnel and Training Research Laboratory. Since AFQT scores had not been recorded for most of these men, it was necessary to estimate AFQT scores from scores on the Basic Test Battery, through the use of multiple-linear regression. For this purpose beta weights were computed using a sample of 488 recruits tested at the Naval Training Center, San Diego in April 1966. Multiple correlation of the predictors with AFQT for the weight determination sample was .77, using GCT, ARI, MECH, and CLER scores as predictors. With the exception of Filipino recruits specifically procured for the Steward rating, who were excluded from the study, predicted AFQT scores were computed for all men in the original data base who had complete sets of BTB scores. These 19,584 men were designated the Original Recruit Sample.

The Retention Sample consisted of 3,365 men from the Original Recruit Sample who were still in the Navy on 30 June 1967.

2. Analysis

The Navy occupational rating of each man in the Original Recruit Sample was determined by means of his four-digit enlisted rating code. The men were then classified on the basis of their predicted AFQT scores into one of four groups:

<u>Group</u>	<u>Predicted AFQT Score Range</u>
Category IV (IV)	30th Percentile or below
Low Category III (Low-III)	31st through 48th Percentiles
High Category III, Category II (High III-II)	49th through 92nd Percentiles
Category I (I)	93rd Percentile or above

This classification was carried out by determining the z-score equivalents of the percentile scores shown above. The predicted AFQT scores of the Original Recruit Sample corresponding to these z scores were used to establish the limits of the mental level categories. Classification was then made on the basis of categories so defined. This equal percentile conversion was used to minimize the regression effect in the predicted AFQT scores, but it could not correct for the inaccuracies caused by the less than perfect R between BTB scores and AFQT.<sup>1</sup>

For men in the above four groups, rates of assignment to each Navy rating present in the Retention Sample were determined. Average lengths of service of the men in the different mental levels were computed and tested for significant differences using Duncan's new multiple range test as modified for groups with unequal Ns.

For comparison purposes, two sets of statistics were computed from data available at this Laboratory:

1. Estimates of the percentages of IVs originally assigned to the ratings were computed using data for appointments to A-Schools from July 1966 through December 1968.

2. Estimates of the average mental ability of the students from A-Schools for each rating were computed by summing the GCT plus ARI scores for A-School students from a sample used in a previous study (Thomas & Thomas, 1967).

## C. RESULTS AND DISCUSSION

### 1. Retention Rates and Pay Grades for Mental Groups

Rates of retention for the four groups (shown in Table 1) ranged from 12.5 to 18.7, with the retention rate for IVs being substantially lower than those for the other groups. About 90 percent of the Retention Sample were IIIs or IIs, and about 7 percent of the Sample were IVs. Pay grade had a positive monotonic relationship to mental level category, with the greatest difference between adjacent means being between the IVs and Low-IIIs.

Consideration was given to the possibility that the higher mean pay grades of men in the higher mental groups resulted from longer average

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<sup>1</sup>However, one source of inaccuracy in the AFQT score, the malingerers who score low on the test in hopes of failing it and thus avoiding military service, would be eliminated by this method. Since the estimates of mental level are based on tests in which the men's interests lie in maximizing their performance, data contamination from malingering presumably would be eliminated. In a recent study at NPTRL approximately five percent of the sample were estimated to be "false IVs."

TABLE 1

Descriptive Statistics Concerning Personnel of the Different Mental Levels in the Original Recruit and Retention Samples

Variable	IV	Low-III	High III-II	I	Total/Average
1. Number in Original Recruit Sample	1,981	2,764	14,347	492	19,584
2. Number in Retention Sample	244	414	2,615	92	3,365
3. Percentage of Original Recruit Sample	10.1	14.1	73.3	2.5	100.0
4. Percentage of Retention Sample	7.3	12.8	77.2	2.7	100.0
5. Percentage of Original Recruit Sample Retained	12.5	16.7	18.3	18.7	18.1
6. Retention Sample Mean Pay Grade	5.21	5.54	5.76	6.13	5.70
7. Retention Sample Mean Years in Service	9.93	10.04	9.21	8.92	9.39

service in the groups (line 7 of Table 1). Average lengths of service were computed separately for all mental groups and differences among the lengths of service were tested for significance, using Duncan's new multiple range test as modified for different  $N_s$ . The mean length of service for the Retention Sample was 9.39 years with a standard deviation of 1.88 years. Low-IIIs and IVs had average lengths of service which were significantly longer than those of High III-IIs and Is, but the differences between the means do not appear to account for the observed differences in pay grades.

## 2. Career Distribution of IVs

Table 2 presents rates of assignment in the Retention Sample by rating and mental level. Only those ratings with more than five percent in the IV range have been included in the table; for the ratings with five percent IVs or less, similar data are presented in Table 3. Statistics reported for ratings having small  $N_s$  should be interpreted with caution. (For example, Table 2 indicates that 100 percent of the men in the Lithographer rating were IVs. However, only one man constituted the entire sample.)

TABLE 2  
Numbers and Percentages in Mental Level Classifications and Other Selected  
Statistics for Ratings Having more than Five Percent IVs

DOD Code <sup>a</sup>	Rating Category		Assignment to Ratings								Total Assigned	Percentages of A-School Assignees Who were IVs (1966-67)	Mean of A-School Students (GCT+ARI)
			IV		Low-III		High III-II		I				
			N	%	N	%	N	%	N	%			
7	Lithographer	(LI)	1	100	-	-	-	-	-	-	1	-	-
7	Molder	(ML)	4	80	-	-	1	20	-	-	5	-	-
8	Steward	(SD)	12	80	2	13	1	7	-	-	15	1.3	70 <sup>b</sup>
8	Ships Serviceman	(SH)	11	78	3	21	-	-	-	-	14	1.3	-
8	Commissaryman	(CS)	16	53	6	20	8	27	-	-	30	1.3	-
7	Boatswain's Mate	(BM)	14	50	5	18	9	32	-	-	28	-	-
5	Postal Clerk	(PC)	1	33	-	-	2	67	-	-	3	-	-
6	Gunner's Mate	(GM)	11	29	8	21	17	45	2	5	38	.2	-
6	Aviation Boat- swain's Mate	(AB)	5	29	4	24	8	47	-	-	17	.7	78
7	Builder	(BU)	2	29	1	14	4	57	-	-	7	.8	90
6	Engineman	(EN)	12	27	14	31	19	42	-	-	45	.1	86 <sup>b</sup>
7	Shipfitter	(SF)	11	26	9	21	23	53	-	-	43	2.1	82 <sup>b</sup>
5	Storekeeper	(SK)	14	24	23	40	21	36	-	-	58	.5	102 <sup>b</sup>
2	Signalman	(SM)	3	23	4	31	6	46	-	-	13	1.6	74
5	Disbursing Clerk	(DK)	6	21	13	47	9	32	-	-	28	-	110
6	Aircraft Survival Equipmentman	(PR)	3	19	1	6	12	75	-	-	16	.3	86
5	Aviation Storekeeper	(AK)	7	18	12	31	20	51	-	-	39	.4	94
5	Personnelman	(PN)	6	17	9	25	21	58	-	-	36	.6	102
6	Aviation Machin- ist's Mate	(AD)	21	13	33	21	106	66	-	-	160	.1	88 <sup>b</sup>
6	Aviation Ordnanceman	(AO)	6	13	13	29	26	58	-	-	45	.2	88 <sup>b</sup>
4	Musician	(MU)	4	11	6	16	25	68	2	5	47	3.0	102
6	Aviation Struc- tural Mechanic	(AM)	18	10	35	19	127	31	-	-	180	.6	88 <sup>b</sup>
6	Boilerman	(BT)	15	9	29	17	128	74	-	-	172	.8	90 <sup>b</sup>
6	Instrumentman	(IM)	1	9	2	18	8	73	-	-	11	-	-
6	Machinist's Mate	(MM)	19	8	47	20	170	71	2	1	238	.3	120 <sup>b</sup>
5	Yeoman	(YN)	6	7	29	33	52	59	1	1	88	1.0	102
6	Electrician's Mate	(EM)	5	6	9	12	64	82	-	-	78	.4	108
Total Ns			234		317		887		7		1445		

<sup>a</sup>DOD CODE LEGEND: 2. Communications and Intelligence Specialists; 4. Other Technical and Allied Specialists; 5. Administrative Specialists and Clerks; 6. Electrical/Mechanical Equipment Repairmen; 7. Craftsmen; 8. Service and Supplyhandlers.

<sup>b</sup>Mean composite score of a rating especially suitable for IVs.

TABLE 3

Numbers and Percentages in Mental Level Classifications and Other  
Selected Statistics for Ratings Having Fewer than Six Percent IVs

DOD Code <sup>a</sup>	Rating Category	Mental Levels								Total Assigned	Mean of A-School Students (GCT+ARI)
		IV		Low-III		High III-II					
		N	%	N	%	N	%	N	%		
5	Aviation Maintenance Administrationman (AZ)	1	5	3	15	16	80	-	-	20	100
7	Machinery Repairman (MR)	1	4	-	-	22	96	-	-	23	96
3	Dental Technician (DT)	1	4	6	25	17	71	-	-	24	100
3	Hospital Corpsman (HM)	3	3	18	17	83	80	-	-	104	106
6	Interior Communications Electrician (IC)	1	2	11	21	39	75	1	2	52	106
1	Sonar Technician (ST)	1	2	1	2	50	96	-	-	52	110
4	Photographer's Mate (PH)	1	2	3	7	41	91	-	-	45	104
6	Aviation Electrician's Mate (AE)	1	1	8	12	60	87	-	-	69	92
7	Quartermaster (QM)	-	-	4	57	3	43	-	-	7	-
7	Equipment Operator (EO)	-	-	2	50	2	50	-	-	4	88
7	Damage Controlman (DC)	-	-	2	40	3	60	-	-	5	84
1	Torpedoman's Mate (TM)	-	-	5	33	10	67	-	-	15	96
6	Aviation Support Equipment Technician (AS)	-	-	4	24	13	76	-	-	17	-
2	Radarman (RD)	-	-	22	20	87	79	1	1	110	98
5	Data Processing Technician (DP)	-	-	1	7	13	93	-	-	14	-
2	Air Controlman (AC)	-	-	1	4	24	96	-	-	25	116
4	Aerographer's Mate (AG)	-	-	1	4	25	96	-	-	26	114
2	Communications Technician (CT)	-	-	1	1	60	91	5	8	66	122
1	Tradesman (TD)	-	-	2	1	128	94	6	5	136	118
1	Fire Control Technician (FT)	-	-	1	1	133	90	13	9	147	126
4	Illustrator Draftsman (DM)	-	-	-	-	5	100	-	-	5	-
5	Journalist (JO)	-	-	-	-	4	100	-	-	4	-
4	Engineering Aid (EA)	-	-	-	-	2	100	-	-	2	-
7	Construction Electrician (CE)	-	-	-	-	2	100	-	-	2	102
6	Construction Mechanic (CM)	-	-	-	-	2	100	-	-	2	86
2	Photographic Intelligenceman (PT)	-	-	-	-	2	100	-	-	2	-
	Opticalman (OM)	-	-	-	-	1	100	-	-	1	-
7	Steelworker (SW)	-	-	-	-	1	100	-	-	1	-
7	Patternmaker (PM)	-	-	-	-	1	100	-	-	1	-
1	Aviation Electronics Technician (AT)	-	-	3	-	641	94	39	6	683	126
1	Electronics Technician (ET)	-	-	1	-	193	90	20	9	214	134
	Total Ns	10		97		1728		85		1920	

<sup>a</sup>DOD CODE LEGEND: 1. Electronic Equipment Repairmen; 2. Communications and Intelligence Specialists; 3. Medical and Dental Specialists; 4. Other Technical and Allied Specialists; 5. Administrative Specialists and Clerks; 6. Electrical/Mechanical Equipment Repairmen; 7. Craftsmen.

As is shown in the tables, IVs were present in 60.3 percent (35 ratings), compared with 82.8 percent of the ratings having Low-IIIs and substantially all ratings (96.6 percent) having High III-IIs. Thus IVs were present in substantially fewer ratings than were the other two groups.

Category IVs were present in substantial numbers in four of the eight DOD occupational areas and were most highly concentrated in the Service and Supplyhandlers and Craftsmen occupational areas. For the ratings in those areas, there was a pronounced tendency for IVs to be the most numerous mental level, but the Ns tended to be small. In comparison with the above two occupational areas, IVs constituted smaller percentages of the Administrative Specialists and Clerks and Electrical/Mechanical Equipment Repairmen ratings, but in general the Ns were larger.

Eight ratings, Shipfitter (SF), Steward (SD), Commissaryman (CS), Ships Serviceman (SH), Boatswain's Mate (BM), Gunner's Mate (GM), Engineman (EN), and Storekeeper (SK), seemed especially suitable for IVs. For each of these ratings IVs had Ns of ten or more and constituted more than 20 percent of the rating in the Retention Sample. Four ratings, Aviation Machinist's Mate (AD), Aviation Structural Mechanic (AM), Boilerman (BT), and Machinist's Mate (MM), also seemed suitable for IVs. Each had ten or more IVs, with IVs representing from 8 to 13 percent of the Retention Sample.

Table 2 permits a comparison of the percentages of IVs in the ratings in the Retention Sample with an estimate of the percentages originally appointed to those ratings. Because of the generally high passing rates for A-Schools (usually over 90 percent), the percentages of IVs shown as having been admitted to the associated A-Schools (the next to last column) should agree quite closely with the percentages originally assigned to the ratings.<sup>2</sup> For all of the ratings in the table except AM and PR (which required A-School training during the period covered by this study), the men originally assigned may have been supplemented by men who entered the rating after having received on-the-job training.

In Table 2 differences between the percentages of IVs in the Retention Sample and the percentages of IVs in the Original Recruit Sample assigned to the ratings are often very large. IVs constituted only a fraction of a percent of the men assigned to most A-Schools, with their largest rate of assignment having been three percent. In contrast, IVs made up much larger percentages of men in these ratings

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<sup>2</sup>It is, of course possible that disproportionate numbers of IVs fail A-School, thus rendering inaccurate this estimate. However, computations made at this Laboratory of the failure rate for IVs in A-Schools during the two-year period subsequent to the initiation of Project 100,000 showed that for the great majority of A-Schools the failure rate for IVs was only a few percentage points higher than that for I-IIIs.

in the Retention Sample, with 23 being the median percentage. Thus, for most of the ratings in the table, IVs appear to have had considerably higher rates of retention than the other groups.

Data on retention rates under Project 100,000 have not become available yet either for the four-year enlistments used prior to early-1968 or for the two-year enlistments which have been used since that time. The first analyses of these data will cast light only on the problem of short term retention.

An important question to be answered in evaluating Project 100,000 is the extent to which Category IV personnel will be retained on a career basis in the Navy. The quality standards for reenlistment stated in the Bureau of Naval Personnel Manual (pp. 34-17, 34-18) militate against reenlisting personnel with a tenth grade education or less or a GCT score of 41 or lower if they have demonstrated substandard capability as sailors. Since personnel having these educational and GCT characteristics will be Category IVs in the vast majority of cases, greater loss of IVs than non-IVs is to be expected. How extensive this loss might be, however, has yet to be determined. Data from the present study suggest that for many ratings there will actually be no shortfall but an overage in the rate of reenlistment of IVs in comparison with that for non-IVs.

### 3. Desirable Placement Policy for IVs

Superior retention is only one consideration on which Navy assignment policy concerning IVs should be based. Other important considerations are the costs of training and the expected on-the-job performance of IVs relative to those of the other mental levels. Comparisons of on-the-job performance characteristics of IVs and I-IIIs will be covered in a future report.

Studies of retention in enlisted ratings made by the Secretary of the Navy's Task Force on Navy and Marine Corps Personnel Retention (Office of the Secretary of the Navy, v. VII, p. 210) show that there is considerable variation in retention rates of career men among the four occupational areas having substantial numbers of IVs. For 1965, the most recent year covered by the Task Force Study, the career enlistment ratio for Electrical/Mechanical Equipment Repairmen ratings was classified as critically low and that for ratings in the Craftsmen area was classified as very low. On the other hand, Administrative Specialists and Clerks were found to have retention at a sustaining balance, and Service and Supplyhandlers had a high retention rate. Therefore, investigation of the performance characteristics of IVs for ratings in the Electrical/Mechanical Equipment Repairmen and Craftsmen occupational codes offers the greatest potential payoff for the Navy.

An important question to explore in such an investigation is the possibility of increasing the number of ratings in these two occupational

areas to which IVs may be assigned. A logical criterion for identifying such ratings is the mental ability characteristics of career enlisted men assigned to the ratings.

Tables 2 and 3 provide average composite scores for use as estimates of the average mental abilities of students of the A-Schools associated with the ratings. This composite is formed as the sum of two highly correlated tests, GCT and ARI, which are scaled as Navy Standard Scores. Its expected mean is 100 and its expected standard deviation is 18.8.

In Table 2 mean composite scores for eight of the ratings for which IVs were especially suitable are indicated by <sup>b</sup>superscript. These scores indicate the relatively low average mental abilities of men assigned to the ratings. With two exceptions, the scores ranged between 80 and 90. This suggests that IVs might be similarly suitable for other ratings in these occupational areas having approximately the same average mental levels.

The average composite scores of students of A-Schools in the following ratings in the Electrical/Mechanical Equipment Repairmen area were at 88 or below: Construction Mechanic (CM), Aviation Ordnanceman (AO), Aircrew Survival Equipmentman (PR), and Aviation Boatswain's Mate (AB). Students of the A-Schools of the Craftsmen ratings of Damage Controlman (DC), Equipment Operator (EO), and Builder (BU) has average scores of 90 or lower.

#### D. SUMMARY AND FINDINGS

The present study was concerned with evaluating Navy ratings in terms of their suitability for Category IV career enlisted personnel. Personnel in the study consisted of men who enlisted from 1953 to 1965, with an average length of service of slightly more than nine years. The Original Recruit Sample had 19,584 men and the Retention Sample (personnel on hand in June 1967) had 3,365 men. The men were classified into four mental levels on the basis of predicted AFQT scores.

The major findings of the study were:

1. Category IV personnel were found in 35 ratings in the Retention Sample. Low-IIIs, High III-IIs, and Is were found in 45, 56, and 11 ratings respectively. These figures undoubtedly reflect the effective restriction in the types of ratings to which IVs were eligible for assignment on the basis of their BTB and Special Test scores. They may also reflect elimination of IVs from certain ratings because of failure to meet the standards for reenlistment.

2. An overall rate of retention of 18.1 percent was noted for the sample. Retention rates for the different mental level groups ranged from 12.5 percent to 18.7 percent, with the rate for IVs being substantially lower than those for the other three groups.

3. Based on comparison of the percentages of IVs present in the Retention Sample with the percentages of IVs normally assigned to the A-Schools associated with those ratings, it was concluded that for many ratings IVs had higher retention rates than the other mental levels--despite the overall lower than average retention rate for IVs.

4. Using a criterion of above average retention, the 12 ratings for which Category IVs appear to be most suitable are Aviation Machinist's Mate (AD), Aviation Structural Mechanic (AM), Boilerman (BT), Machinist's Mate (MM), Ships Serviceman (SH), Steward (SD), Commissaryman (CS), Boatswain's Mate (BM), Gunner's Mate (GM), Engineman (EN), Shipfitter (SF), and Storekeeper (SK).

These ratings were in the DOD occupational areas of Administrative Specialists and Clerks, Electrical/Mechanical Equipment Repairmen, Craftsmen, and Service and Supplyhandlers. However, the only two of these areas in which retention of enlisted men has been a problem for the Navy are Electrical/Mechanical Equipment Repairmen and Craftsmen. If subsequent research shows IVs to perform satisfactorily in these ratings, this finding suggests that expansion of the numbers of IVs assigned to ratings in those areas holds the greatest possibility of payoff to the Navy.

5. In the above context, the following ratings in the Electrical/Mechanical Equipment Repairmen area hold the most promise of being suitable for IVs: Construction Mechanic (CM), Aviation Ordnanceman (AO), Aircrew Survival Equipmentman (PR), and Aviation Boatswain's Mate (AB). The most promising ratings for IVs in the Craftsmen occupational area are Damage Controlman (DC), Equipment Operator (EO), and Builder (BU).

Since the above findings are based upon predicted AFQT scores, they must be considered as tentative pending replication with a study utilizing actual AFQT scores. At the present time several studies of this type are being conducted at this Laboratory. Information concerning the performance of IVs over an 18-month to 2-year period has been gathered and will be reported shortly.

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13 ABSTRACT The advent of Project 100,000 made it especially important to determine the best means of utilizing Category IV men in the Navy. In particular it became important to learn which ratings were most suitable for these men in terms of retention. A related interest is whether IVs have generally higher retention rates than personnel in other mental levels.  The present study involved analysis of data based on the men retained from a sample of approximately 19,500 men after an average of nine years service. After categorizing them by mental level within each of the ratings present in the sample, ratings and types of ratings most suitable for IVs in terms of long term retention were determined. Ratings having few or no IVs to which IVs might be suited for assignment were identified.  Category IV personnel were found to have been retained at a substantially lower rate and to be present in substantially fewer ratings than men in the other mental levels. Despite the overall lower than average rate, for many ratings IVs had rates of retention substantially higher than other mental levels. ( ) ←			

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