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THE NUCLEAR-TRAINED PETTY OFFICER CONTINUATION BONUS: FIRST YEAR'S EXPERIENCE-EXECUTIVE SUMMARY

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This report is an executive summary of R-1519-ARPA. The response of the Navy's Nuclear-Trained Enlisted Force to a special continuation bonus, enacted by Congress in 1972 to forestall an expected shortage of supervisors. The Nuclear-Trained Petty Officer Continuation Bonus, payable to reenlistees with six to ten years' completed service, accumulates to more than $12,000 over the reenlistment term. The direct effect of this unique reenlistment incentive is analyzed here with data from the first four full quarters of bonus experience. Findings indicate that (1) the overall reenlistment rate for NTPOs with six to nine years' service has more than doubled between pre-bonus and bonus periods; (2) the reenlistment rate at six years shows the smallest improvement; (3) the NTPO-CB has been responsible for 862 additional man-years; (4) from FY1974 to FY1978, the bonus is projected to result in 900 additional reenlistments; and (5) total additional costs per additional man decline steadily over the projection period. 100 pp. (ETG)

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The Nuclear-Trained Petty Officer Continuation Bonus: First Year's Experience—Executive Summary

Craig B. Foch

A Report prepared for

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

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SANTA MONICA, CA. 90406

PREFACE

This report was prepared as part of Rand's DOD Training and Manpower Management Program, sponsored by the Human Resources Research Office of the Defense Advanced Research Projects Agency (ARPA). In response to the ever-increasing importance of manpower considerations in the Department of Defense, this research program will bring new methodologies to bear on present and future military manpower problems. With the advent of the volunteer force and the resulting emphasis on the development of efficient schemes for managing military personnel, alternative compensation incentives for manpower management warrant careful attention. It is within this frame of reference and with the cooperation of the Compensation Directorate, Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), that this study was undertaken.

The Nuclear-Trained Petty Officer Continuation Bonus: First Year's Experience, R-1519-ARPA (The Rand Corporation, August 1974), which this report summarizes, investigates the response of the Navy's Nuclear-Trained Enlisted Force (NTF) to a special continuation bonus, enacted by Congress in 1972 and first available in October of that year. The response is measured in terms of reenlistment rate levels and changes, bonus-induced additional man-years and costs, and projections of total NTF manpower levels and costs, FY1974 to FY1978.

Because the evidence on which these several measures of bonus response are based is limited to the first four full quarters of existence of the bonus (Jan. 1, 1973 to Dec. 31, 1973), all of the results reported here should be viewed as tentative and preliminary; they will require verification over time as experience with the bonus accumulates.

SUMMARY

During the final five quarters preceding the arrival of the Nuclear-Trained Petty Officer Continuation Bonus (July 1, 1971 to Sept. 30, 1972), first-term reenlistment rates averaged 15.1 percent. During the first four full quarters of operation of the bonus program (Jan. 1, 1973 to Dec. 31, 1973), first-term reenlistment rates averaged 34.7 percent. This dramatic improvement in retention translates to 862 additional man-years of obligated service at an average committed-dollar cost of $6413 per additional man-year. Projecting the first year's experience into the future yields a prediction of 4466 experienced Nuclear-Trained Petty Officers by June 30, 1978--846 of whom are directly attributable to the continuation bonus. Annual bonus cost per additional experienced man is projected to decline to $4550 by 1978 and even further in the longer run.

It is expected that in the years ahead the bonus will also cause increases in the average number of years served before first reenlistment and in the number of second-term reenlistments. Though not currently testable, these expectations impart a conservative flavor to the results presented here. The true long-run contribution of the bonus may well be much larger than indicated.

ACKNOWLEDGMENTS

The dispatch with which this analysis was accomplished is due in large part to the competence and cooperation of the Compensation Directorate, Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), which provided the reenlistment data on which the analysis is based. Special notes of thanks are due its director, Capt. James B. Campbell, USN, and Comdr. Dee Fitch, USN, for aid in interpretation and documentation of the basic data.

Programming assistance was provided by Alfred B. MacInnes of the Rand Computation Center. The reviews of William H. Albright, William P. Butz, and Susan Marquis were thoughtful, painstaking, and much appreciated. The draft manuscript was cheerfully and expertly typed by G. M. O'Brien.

Finally, the author acknowledges a large debt of gratitude to Richard V. L. Cooper and Gary R. Nelson for their unflagging support, guidance, and assistance throughout the course of the study.

THE NUCLEAR-TRAINED PETTY OFFICER CONTINUATION BONUS: FIRST YEAR'S EXPERIENCE--EXECUTIVE SUMMARY

In the context of a 2.2-million-man armed force, the Navy's 10,000-man Nuclear-Trained Enlisted Force (NTF) is small, but not unimportant. These men constitute the first line of responsibility for maintenance, operation, and supervision of the propulsion systems of the Navy's nuclear submarine and surface ships, which are among the most expensive weapon systems in existence and a principal element in the U.S. strategic defense triad.

The importance attached to this responsibility is reflected in the NTF entrance process. Rigorous selection standards limit the pool from which new manpower may be drawn; and once selected, the prospective Nuclear-Trained Petty Officer (NTPO) must undergo nearly two years of academic and experiential* training. Thus, response to increasing personnel requirements is both expensive and time-consuming. This situation holds even more strongly with respect to supervisory-grade NTPOs, who must have several years' experience in nuclear power, in addition to having been fully trained. In consequence, the only source of nuclear-trained supervisors is first-term personnel.

When the first data specific to the NTF appeared in FY1970, it was evident that retention of NTPOs was a problem area. The reenlistment rate among NTPOs with six to nine years' service that year was only 18.7 percent; in FY1971 it was only 16.1 percent. By FY1972, when the rate fell to 13.5 percent, Navy manpower planners foresaw a large shortfall in experienced NTPOs in the late 1970s, when scheduled arrivals of the Trident class of submarines would swell manning requirements.

The retention crisis was not due to a lack of effort on the Navy's part. NTPOs are promoted through the pay grades as quickly as regulations allow and are eligible for proficiency pay as early as the third

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*In one of several land-based nuclear-propulsion prototypes operated jointly by the Navy and the Atomic Energy Commission.

year of service* and maximum Variable Reenlistment Bonus (VRB) awards† in years five through eight. These, together with other special pays,‡ can boost NTPO annual earnings as high as $14,507. But the work is demanding and requires long periods of isolation at sea, and the civilian alternatives available to nuclear personnel as technicians in commercial nuclear power stations are well paid.

The Navy's reaction to the crisis was to request Congressional authority for a new category of pay--the Nuclear-Trained Petty Officer Continuation Bonus (NTPO-CB). Congress concurred, and the NTPO-CB became available Oct. 27, 1972. It is paid to reenlistees with six to nine years of completed service in annual installments that range from $3109 to $3762** over the reenlistment term (usually four years).

The effect of this new bonus on present and future NTF manpower levels is seen to have three distinct components. First, those currently eligible for the bonus--NTPOs with six to nine years of service--may reenlist at a higher rate (a direct effect). Second, in anticipation of the bonus, more men in years of service three through five will agree to extensions beyond the minimum six-year term to qualify for proficiency pay (an anticipatory effect). Third, men who accept the NTPO-CB will become eligible to reenlist again four years hence, and past experience indicates a high proportion may choose to remain in the Navy until retirement (a career effect).

Because experience with the bonus is limited--only four full quarters of reported data as of this writing††--neither the anticipatory

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*$1200 per year for E-5s, $1800 per year for E-6s with more than 6 years of service. To be eligible, the NTPO must agree to extend his initial commitment of six years to seven or more.

†$2195 per year for an E-5. All NTPOs receive the first two installments, i.e., those for years five and six. Only those who extend initial commitments receive the final two installments in years seven and eight.

‡Sea pay ($192-$240 per year) and submarine pay ($840-$1020 per year).

**Depending on the NTPO's pay grade at time of reenlistment. These and all other pay figures are based on 1973 rates of pay and regulations.

††That is, Jan. 1, 1973 to Dec. 31, 1973.

nor the career effect is currently observable, and the analysis summarized here therefore focuses on its direct effect: the response of NTPOs currently eligible for the bonus. This imparts a conservative bias to the results presented below; given the limited evidence available, they may not reflect the true long-run effects of the NTPO-CB, but they are more likely to be too low than too high.

The response to the bonus can be measured in a variety of ways, depending on the purpose of the analysis. There are, first of all, the obvious measures of the reenlistment rate levels and changes. Judged by these criteria (see Table 1), the response to the NTPO-CB has been impressive but not uniform across all experience categories. That is, overall and component reenlistment rates have more than doubled between pre-bonus and bonus periods; rates at seven, eight, and nine years show substantial and roughly comparable improvement; but the rate at six years remains quite low.

Table 1

NTF REENLISTMENT RATES BY COMPLETED YEARS OF SERVICE (YOS) AND COMPONENT, PRE-BONUS AND BONUS PERIODS

(Percent)

YOS/Component	Pre-Bonus 7/1/71-9/30/72	Bonus 1/1/73-12/31/73	Change
6	2.5	9.2	+6.7
7	22.5	50.0	+27.5
8	32.6	58.7	+26.1
9	40.4	67.1	+26.7
Total	15.1	34.7	+19.6
Total submarine	16.4	37.9	+21.5
Total surface	10.7	23.6	+12.9

That six-year eligibles should prove fairly immune to the NTPO-CB is not surprising: By electing not to extend their initial commitments, they have already forfeited substantial cash benefits (proficiency pay

and two VRB awards). The reasonable inference to draw, in fact, is that the long-run equilibrium reenlistment rate at six years is near zero; the NTPO-CB cannot be expected tc affect the behavior of individuals who follow this path, but rather the number who do so.

In the perspective of budgeting and manpower planning, the response to the NTPO-CB may be measured in terms of additional man-years induced by the bonus and costs (see Table 2, cols. 1 and 2). The former are defined as the man-year equivalents of bonus-induced reenlistments, which in turn are defined as the actual number observed, less the number that would have been observed had pre-bonus reenlistment rates prevailed.* According to this measure, the contribution of YOS-group† six is substantial, partly because almost all reenlistments at six years are bonus-induced and partly because of the sheer volume of men involved--six-year eligibles represent over 40 percent of total eligibles. Conversely, the contribution of YOS-group nine is limited by its small size--roughly 10 percent of total eligibles--and by its high pre-bonus reenlistment rate.‡

Bonus costs are calculated by multiplying the full NTPO-CB individual award** by the total number of bonus-period reenlistments. As with man-years, YOS-groups seven and eight dominate; but note that since costs are incurred on bonus-induced and non-induced reenlistments alike, YOS-group nine costs half again as much as YOS-group six while contributing fewer man-years.

A measure of the cost-effectiveness of the NTPO-CB is provided by

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*Symbolically, if r and r' are pre-bonus and bonus reenlistment rates, and N' is bonus-period eligibles, then bonus-induced reenlistments, R_b, may be written

$$R_b = (r' - r)N' .$$

†YOS = years of completed service.

‡That is, although 67.2 percent of YOS-group nine reenlisted during the reported bonus period, previous experience indicates that 41.4 percent would have done so even without the NTPO-CB. Thus, only about one out of three reenlistments may be classified as bonus-induced.

**The full award is defined as the undiscounted sum of annual bonus payments made during the bonus reenlistment term.

Table 2

BONUS COST PER BONUS-INDUCED MAN-YEAR, TOTAL NTF BY COMPLETED YEARS OF SERVICE (YOS) AND COMPONENT, 1/1/73-12/31/73

	(1)	(2)	(3)
YOS/Component	Induced Man-Years	Total Bonus Cost ($1000)	Bonus Cost per Bonus-Induced Man-Year ($)
6	162.9	696	4273
7	270.6	1588	5868
8	311.4	2259	7254
9	117.1	984	8403
Total	861.9	5527	6413
Total submarine	733.0	4701	6413
Total surface	137.5	827	6015

bonus costs per induced man-year (see Table 2, col. 3): On the average, each additional man-year generated by the bonus is costing the Navy $6413. The variance across YOS-groups reinforces the preceding discussion of relative response, in that the cost per man-year at nine years is roughly double that at six years.

Because the NTPO-CB was created expressly to forestall an expected shortage of supervisory personnel, perhaps the best measure of its effect lies in its implications for *future* NTF manning levels, experience profiles, and costs. These subjects have been addressed by means of an NTF simulation model, which takes as input the actual stock of manpower as of June 30, 1973, and predicts FY1974 eligibles, reenlistments, and first-term extensions. These predictions are used to generate a description of the stock as of June 30, 1974. A second iteration of the model ages the force to June 30, 1975, and so on to the end of FY1978. Projections are made under a "bonus scenario" that uses reenlistment rates observed during the bonus period (calendar 1973) as well as a "no-bonus scenario" that uses rates observed before institution of the bonus.

The results of those projections are summarized in Table 3. Because the two scenarios assume the same annual inputs of newly trained NTPOs, bonus and no-bonus manpower projections for YOS-groups two through

Table 3

PROJECTED NTF MANPOWER, BONUS AND NO-BONUS SCENARIOS, AND BONUS COSTS, FY1974 TO FY1978

FY	Manpower				Bonus Cost ($ × 10^6)	Bonus Cost per Additional Man ($)
	YOS 2-5	YOS 6+ Bonus/No-Bonus	Total Bonus/No-Bonus	Additional Men		
74	7830	2853/2613	10683/10443	240	1.98	8260
75	8845	3067/2714	11912/11559	353	2.65	7510
76	9355	3458/2974	12813/12329	484	3.19	6600
77	9355	4016/3361	13371/12716	655	3.44	5260
78	9355	4466/3620	13821/12975	846	3.85	4550

five are identical--the additional men attributable to the presence of the NTPO-CB are all members of the experienced cadre (YOS 6+). Starting from a pre-bonus FY1972 level of 2883 men, this group of potential supervisors is projected to grow at an average annual rate of 7.6 percent under the influence of the bonus, numbering 4466 by the end of FY1978; without the bonus, the projected growth rate is only 3.9 percent, and the stock at the end point only 3620.

Bonus costs grow rapidly during the first several years in the projection period, until the program reaches full coverage around 1976.* Increases in bonus costs beyond that point are caused by projected increases in the size of the bonus-eligible pool. The projected decline in bonus cost per additional man is caused in part by growth in the relative number of reenlistments at six and seven years† and in part by the continued presence in the NTF of men no longer receiving bonus payments (the career effect).

In summary, the first year's evidence on the special continuation bonus for nuclear-trained petty officers gives solid support to the judgment that it has had a strong positive effect on reenlistments among those eligible for it and, in particular, warrants the following conclusions:

1. The overall reenlistment rate for NTPOs with six to nine years of service has more than doubled, from 15.1 percent to 34.7 percent, between pre-bonus and bonus periods and is expected to rise even higher in future years.
2. The reenlistment rate at six years shows the smallest

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*In the first year of the bonus program, the only men receiving payments are those in the first year of the bonus term. In the second year of the program, these men will receive their second annual installments, and another group of new reenlistees will receive their first payments. By the third year, coverage has extended to the third year of the bonus term, and so on.

With regard to cost per man, it should be noted that because of differences in methodology, the projections reported here are not directly comparable with the measures of observed response appearing in Table 2.

†See Table 2, col. 3.

improvement, and even this is probably transitory. The bonus *is* expected, however, to cause a future decline in the number of NTPOs becoming reenlistment-eligible at six years.

3. During its first four full quarters of existence, the NTPO-CB has been responsible for 862 additional man-years, at an average cost of $6413 (per additional man-year).
4. Over the period FY1974 to FY1978 as a whole, the bonus is projected to result in roughly 900 additional reenlistments, with the experienced cadre (those with six or more years of service) increasing from 2883 in FY1972 to 4466 in FY1978.
5. The bonus cost per additional man in the force declines steadily over the projection period, reaching $4550 in FY1978.