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HUMAN RESOURCE MODELLING IN SUPPORT OF THE ESTABLISHMENT OF A NEW MILITARY OCCUPATION: TACTICAL ACOUSTIC SENSOR OPERATOR

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HUMAN RESOURCE MODELLING IN SUPPORT OF THE ESTABLISHMENT OF A NEW MILITARY OCCUPATION: TACTICAL ACOUSTIC SENSOR OPERATOR

By

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and
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OTTAWA, CANADA

May 1999

National Defence Défense nationale

Operational Research and Analysis

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ABSTRACT

As a result of Canadian Forces re-engineering, new military occupations (MOCs) are being proposed and approved at an unusual pace and modelling such proposals has become a major activity within the Personnel Operational Research Team (PORT). PORT has developed a family of human resource models to examine the long-term demographic trends that might affect the viability of new MOCs. One such MOC is Tactical Acoustic Sensor Operator (TAS OP), formed by amalgamating the Naval Acoustic Operator and Oceanographic Operator occupations. This work was carried out in support of the Chief of Maritime Staff and the TAS OP Occupational Structure Implementation Plan (OSIP). Modelling results suggest that the new TAS OP MOC will be viable despite a scheduled staff reduction.

RÉSUMÉ

Suite au reengineering des Forces canadiennes, de nouveaux groupes professionnels militaires (GPM) sont proposés et approuvés et ce, à un rythme inhabituel. La modélisation de telles propositions est devenue une des principales activités de l'Équipe de recherche opérationnelle en personnel (EROP). L'EROP a développé en outre une panoplie de modèles de ressources humaines pour étudier quelles sont les tendances démographiques à long terme pouvant influer sur la viabilité des nouveaux GPM. Mentionnons à titre d'exemple, la création du GPM - Opérateur de détecteurs acoustiques tactiques - (Op DAT) provenant de la fusion des GPM, Opérateur de détecteurs acoustiques et Opérateur en océanographie. Le travail de l'équipe dans ce cas-là a été accompli en appui au Chef d'état-major de la marine et dans le cadre du Plan de mise en oeuvre de la structure professionnelle de l'Op DAT. Selon les résultats de la modélisation, le GPM de l'Op DAT serait viable malgré une réduction prévue de l'effectif.

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HUMAN RESOURCE MODELLING IN SUPPORT OF THE ESTABLISHMENT OF A NEW MILITARY OCCUPATION: TACTICAL ACOUSTIC SENSOR OPERATOR

I. INTRODUCTION

Background

1. Maritime Human Resource (HR) planners have identified many areas of similarity between the Naval Acoustic Operator (NAC OP) Military Occupation (MOC) 273 and the Oceanographic Operator (OCEAN OP) MOC 191. Non-commissioned members (NCMs) who are in these occupations are responsible for the operation of various types of acoustic equipment as well as internal and underwater communications equipment that manage and transmit acoustic data.

2. These occupational similarities led to the formation of a working group to amalgamate the members from the two trades in May 1995. Phase I of their study determined that it was feasible to develop a new occupation that takes into account all major aspects of the NAC OP and OCEAN OP occupations. In 1996, Phase II of this study produced a plan of action and milestones for further development. Phase III of the study, completed in June 1997, set training requirements and examined the new MOC, now known as Tactical Acoustic Sensor Operator (TAS OP), in the context of the future requirements of the Chief of Maritime Staff (CMS). An Occupation Change Proposal (OCP) was sent from the CMS to National Defence Headquarters (NDHQ) stating his intention to stand up a new occupation 1 January 1999. In September 1997, the Assistant Deputy Minister Human Resources Military (ADM HR-Mil) directed his staff to initiate preparation of an Occupational Structure Implementation Plan (OSIP) for TAS OP - MOC 278. An OSIP team consisting of CMS and ADM HR-Mil personnel was formed in February 1998.

3. In support of the TAS OP OSIP, the Personnel Operational Research Team (PORT) was requested by the Director Military Human Resource Requirements (DMHRR) to develop a HR model of the proposed MOC to examine any long-term demographic trends which might adversely affect the viability of this new MOC [1]. CMS does have a limited MOC modelling capability, but PORT support was requested because CMS personnel were fully occupied at the time with Annual Military Occupational Reviews (AMORs). A model for TAS OP was developed and run, with results made available to the client for inclusion as Annex E of the final OSIP report [2].

Aim

4. The aim of this paper is to document the HR modelling support provided by PORT to the TAS OP OSIP by:

a. outlining major modelling assumptions;

b. reporting the highlights of the results; and

c. developing an overall viability assessment of the proposed MOC.

Results from this analysis are also contained in Annex E of the OSIP report.

5. As a result of Canadian Forces (CF) re-engineering, new occupations are being proposed and approved at an unusual pace and modelling such proposals has become a major activity within PORT. This paper demonstrates the approach taken by PORT analysts in this particular case and is representative of similar studies, either ongoing or completed for other clients.

Caveats

6. PORT, using attrition information contained in its strategic desktop computer database [3], developed the TAS OP 278 model described in this paper. As a result of limited input information and the time constraints imposed by the sponsor of this research, insufficient time was available to conduct a full sensitivity analysis on the results obtained from the model. However, the authors believe that the observed model trends are reliable indicators of the future

"health" of this MOC. Although care was taken to obtain accurate data and to check modelling assumptions, the results reported here should be regarded as preliminary and in need of review if significantly different leaving patterns are identified in future TAS OP attrition data.

II. THE GENERIC MODEL (GeM)

A Model Building Utility

7. The analysis reported here was conducted using a specific application of the Generic Model (GeM) utility - a powerful model building environment that was originally developed by the Directorate of Manpower Analysis (D Man A). Originally GeM was developed as a family of executable programs that operated in the OS/2 environment. GeM now operates in the Windows 95 environment with the use of a Graphical User Interface (GUI). The most recent version of GeM incorporates a visual model building environment as well as model execution animations.

8. Models developed in the GeM environment capture the influences of the many intricacies of the CF's system of career development such as:

a. controlled ranks;
b. minimum time in rank (TIR) requirements before promotion;
c. contract renewal through the CF Career Development Plan (CFCDP) system of gates;
d. minimum/maximum promotion/intake bounds;
e. compulsory retirement age (CRA); and
f. a variety of entry plans having individualized entry demographics.

9. Career flow modelling of CF occupations, as conducted in GeM, has achieved a great deal of acceptance among personnel planners and career

managers. It is a routine part of the analysis supporting occupational restructuring, a tool for investigating the policy alternatives for AMORs, and has provided short term guidance in the setting of intake and CFCDP gate levels to meet occupational objectives. Recently, GeM models have been applied to support more strategic policy development (e.g. [4] to [8]).

10. The GeM TAS OP 278 model was developed and tested after relevant data were extracted from the PORT historical database to form the input assumptions for the model. The TAS OP model can be run satisfactorily (i.e. several minutes for 25 model years) on any modern Windows 95 compatible personal computer, which has been equipped with GeM.

III. METHODOLOGY

GeM Model Assumptions

11. The GeM TAS OP 278 model contains the following major input assumptions:

a. the Preferred manning Level (PML) for each rank in time slice 1 is given in column 1 of Table I below. For time slices 2 to 4, the PMLs are as shown in column 2 of Table I. For time slices 5 to 25, the PMLs are as shown in column 3 of Table I;

b. intake was set as 28 and 32 for time slices 1 and 2 respectively. Minimum/maximum intake is set at 0/48 for time slice 3 onwards. All new recruits are given a basic engagement at the Able Bodied (AB) Seaman rank;

c. minimum TIR for promotion is given in Table II below;

d. voluntary attrition rates are applied to personnel as shown in Table III below. These rates are based on historical attrition for all personnel formerly in MOCs 191 and 273 in the years 1983 to 1997, (excluding the Forces Reduction Program years);

e. promotion probabilities as a function of years of service (YOS) are as shown in Table IV below; and

f. CFCDP gates/conversion probabilities are shown in Table V below.

Table I

TAS OP 278 Preferred Manning Level Assumptions

Model Year 1 is 1999

RANK	PML YR 1	PML YR 2 - 4	PML YR 5 on
Chief Petty Officer First Class (CPO1)	6	6	6
Chief Petty Officer Second Class (CPO2)	24	25	24
Petty Officer First Class (PO1)	43	46	43
Petty Officer Second Class (PO2)	80	82	78
Master Seaman (MS)	90	95	90
Leading Seaman (LS)/ Able Bodied Seaman (AB)	261	261	246
TOTAL	504	515	487

Table II

TAS OP 278 Minimum Time in Rank Criteria for Promotion

Promotion to:	Minimum Time in Rank (Years)
CPO1	2
CPO2	3
PO1	3
PO2	2
MS	2
LS	4

Table III

TAS OP 278 Model Voluntary Attrition Rates by Rank

(Percentage of Population at a YOS level)

YOS	AB	LS	MS	PO2	PO1	CPO2	CPO1
1	10	0	0	0	0	0	0
2	52	0	0	0	0	0	0
3	11	16	0	0	0	0	0
4	15	11	0	0	0	0	0
5	14	9	17	0	0	0	0
6	60	14	3	100	0	0	0
7	0	10	5	22	0	0	0
8	0	11	5	2	0	0	0
9	50	3	6	1	0	0	0
10	0	7	7	4	0	0	0
11	0	9	3	4	0	0	0
12	0	0	0	6	0	0	0
13	0	0	0	0	0	0	0
14	0	10	10	6	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	17	17	17	0	0	0
20	0	11	11	11	3	18	0
21	0	5	5	5	6	5	0
22	0	10	10	10	6	0	0
23	0	6	6	6	10	0	13
24	0	7	7	7	7	15	10
25	0	38	38	38	11	12	0
26	0	38	38	33	0	4	0
27	0	19	19	0	19	10	0
28	0	0	0	0	6	10	25
29	0	0	0	50	38	7	0
30	0	0	0	0	40	4	0
31	0	100	100	50	50	5	13
32	0	0	0	100	50	5	0
33	0	0	0	0	0	6	17
34	0	0	0	0	0	23	0
35	0	0	0	0	50	11	0
36	0	0	0	0	0	33	33

Table IV

TAS OP 278 Model Promotion Probabilities by Rank

(% of those promoted to rank indicated with designated number of YOS)

YOS	To MS	To PO2	To PO1	To CPO2	To CPO1
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	1	0	0	0	0
7	22	1	0	0	0
8	42	6	0	0	0
9	12	23	0	0	0
10	9	18	0	0	0
11	7	20	0	0	0
12	2	6	11	0	0
13	0	10	16	0	0
14	0	6	13	0	0
15	0	6	11	0	0
16	0	1	13	0	0
17	0	1	16	0	0
18	0	0	4	4	27
19	0	0	4	0	0
20	0	0	2	8	14
21	0	0	2	23	0
22	0	0	2	4	14
23	0	0	0	0	0
24	0	0	0	15	0
25	0	0	2	4	27
26	0	0	0	4	14
27	0	0	0	1	0
28	0	0	0	1	0
29	0	0	0	11	0
30	0	0	0	0	0
31	0	0	0	4	0
32	0	0	0	8	0
33	0	0	0	0	0
34	0	0	0	0	0
35	0	0	0	0	0

Table V

TAS OP 278 Model

Assumed CFCDP Engagement* Conversion Probabilities

Rank	Engagement 1	Engagement 2	Conversion Prob.
AB	BE	BE2	100%
LS	BE	BE2	100%
	BE2	IE	90%
	BE2	R	10%
	IE	CE	80%
	IE	IPS	20%
MS	BE	BE2	100%
	BE2	IE	90%
	BE2	R	10%
	IE	IPS	20%
	IE	CE	80%
	IE	EXT	0%
PO2	BE2	IE	90%
	BE2	R	10%
	IE	IPS	100%
PO1	IE	IPS	100%
CPO2	IE	IPS	100%
CPO1	IE	IPS	100%

* BE - Basic Engagement

BE2 - Second Basic Extension

IE - Intermediate Engagement

CE - Continuing Engagement

IPS - Indefinite Period of Service

EXT - Extension

R - Refused (i.e. release)

IV. MODELLING RESULTS FOR TAS OP 278

Deviation from PML

12. One important consideration for assessing the health of an occupation is whether or not proposed policies allow the MOC to maintain PML targets. As such, deviations from PML are indicators of systemic problems. Results from running the TAS OP 278 model over a 25 year period were obtained in the form of a "deviation from PML" chart (shown in Figure 1). There is a shortage at the LS rank in the first five model years due to insufficient intake. The small surplus at the rank of MS in model year 5 is a result of the PML change at that time. There is a balance reached after this. Starting in model year 15, more shortages appear, as intake is insufficient to cope with releases. This situation does not quite stabilize by model year 25.

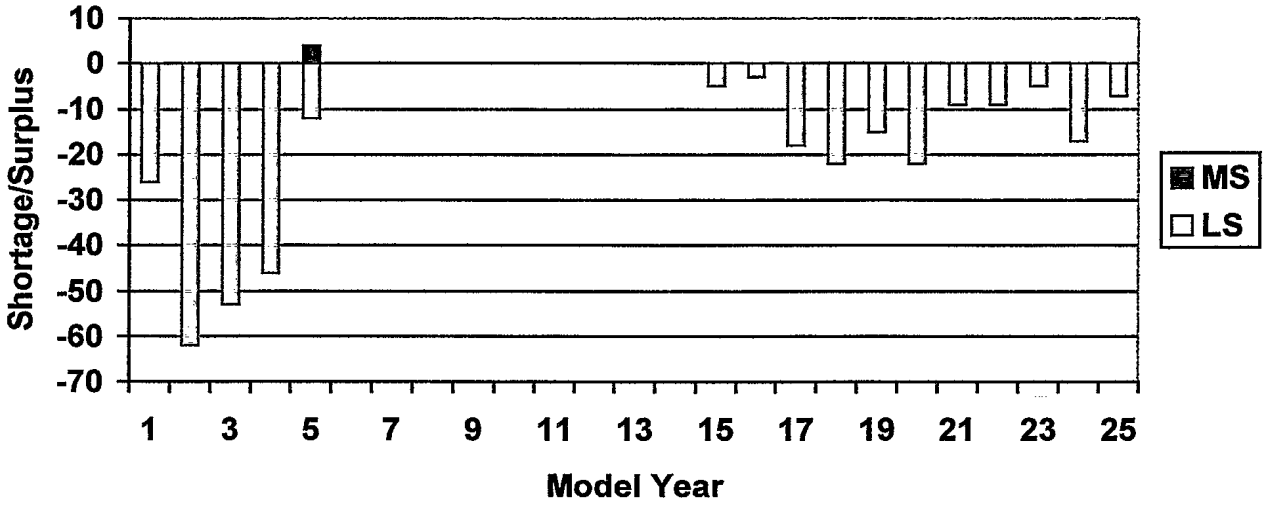

Figure 1: TAS OP 278 Model Forecast Deviation from PML

Strength by Rank

13. Model forecasts for MOC strength (at each rank) are shown in Figure 2, obtained by running the TAS OP model over a 25 year period. The population remains quite stable throughout, particularly at the more senior ranks. There is some variability at the LS/AB ranks in the first few model years as the strength varies between 199 and 246 which is the PML value. There is a ten year period of stability (at the PML) before more shortfalls appear after model year 15. These shortfalls arise from the previously noted difference between intake and attrition in the last ten model years.

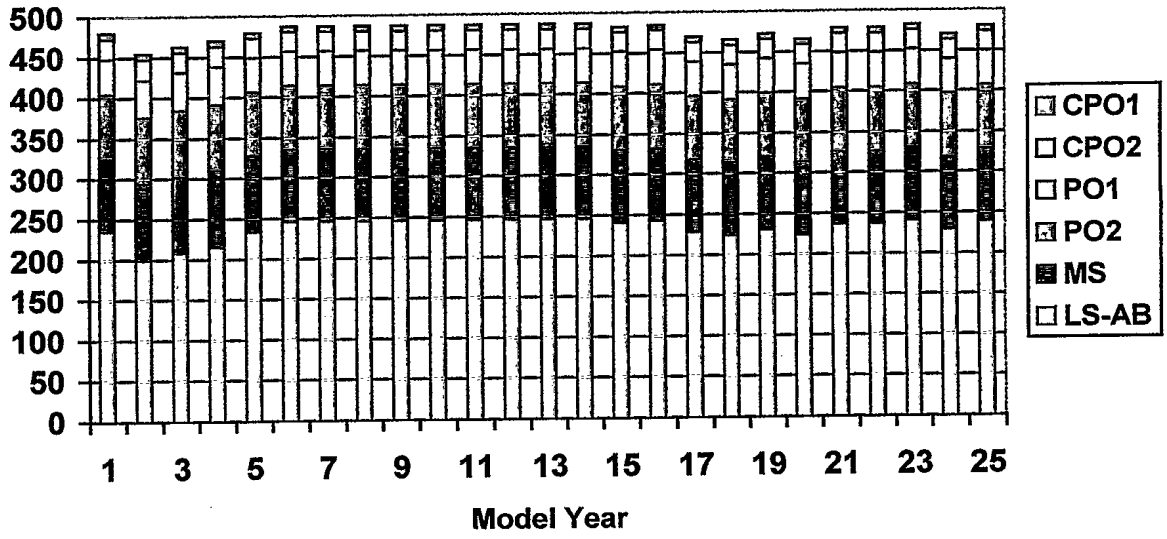

Figure 2: TAS OP Model Forecast Strength by Rank

Intake

14. Intake is an important measure of the health of a MOC. If intake is too small, gaps may appear in the future experience distribution of personnel. On the other hand, if a MOC is always operating at maximum intake, then shortages may arise with respect to PML targets. This is demonstrated in Figure 3 - the observed intake generated by the TAS OP GeM model over a 25 year period. Intake is at a maximum between model years 3 and 6 and for model year 15 onwards. Maximum intake (i.e. the "pipeline") is not sufficient to handle attrition and staff shortages may be anticipated as a result. Figure 1 shows that staff shortages for model year 15 to 25 would be approximately ten to twenty personnel.

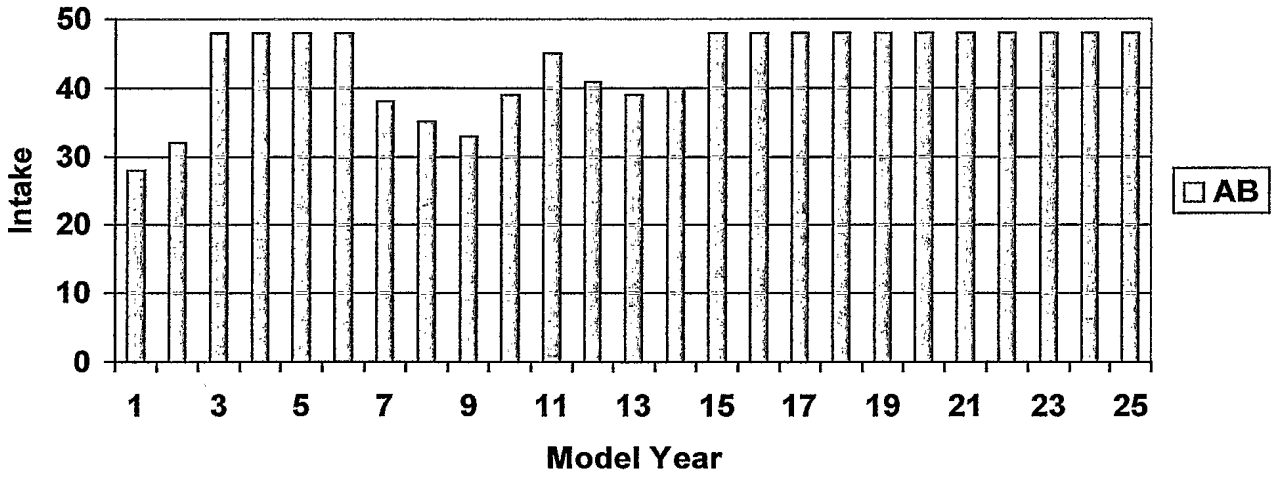

Figure 3: TAS OP Model Forecast Intake

Promotions by Rank

15. Promotion rates are also important measures of the health of a MOC, both from the perspective of morale and the experience levels in each rank. Figure 4 presents the promotion results obtained from running the TAS OP GeM model over a 25 year period. (There are no promotions to the LS rank because this is combined with the AB rank in the model and is effectively set as the intake rank.) The figure shows that promotion rates are quite variable, ranging from a low of 8 (all ranks) in model year 5 to a high of 66 (all ranks) in model years 18 and 20. PML reductions in model year 5 account for the low promotion rate in that year.

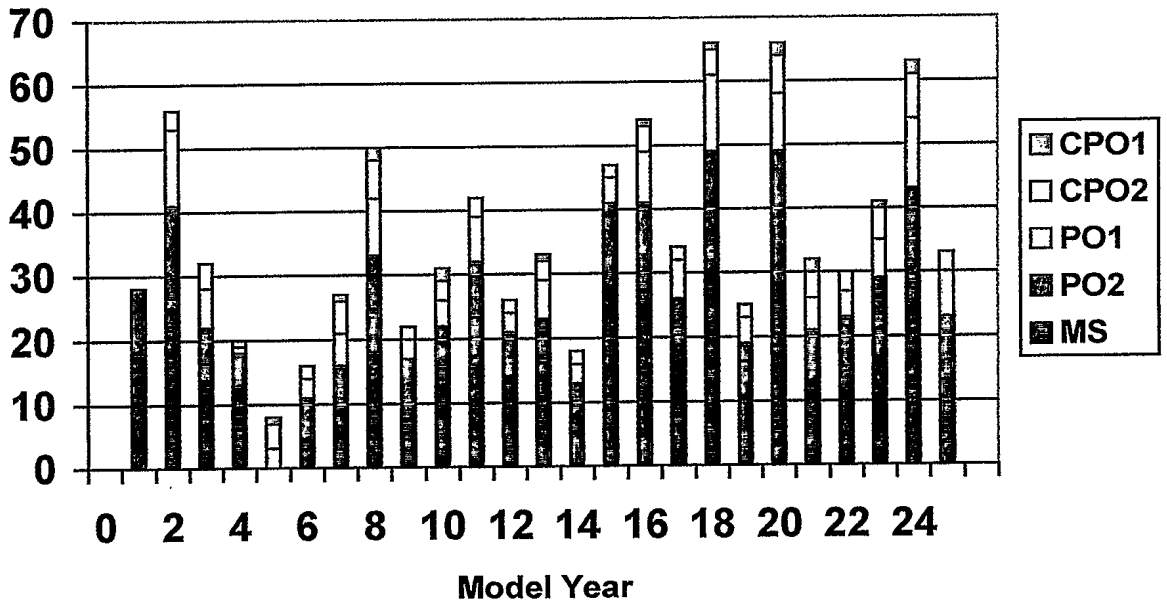

Figure 4: TAS OP Model Promotions (into Rank Shown)

Total Releases

16. Release rates are another measure of the health of a MOC. If releases can be smoothed out, then fewer problems tend to arise in managing the MOC. Figure 5 presents the release results obtained from running the TAS OP GeM model over a 25 year period. Voluntary releases dominate, ranging from 29 to 56 over the timeframe modelled and averaging approximately 40 per year. Personnel reaching Compulsory Retirement Age (CRA) average approximately one per year. Engagement releases average approximately 3 per year, although this is quite variable. Overall, release rates are probably not unacceptable.

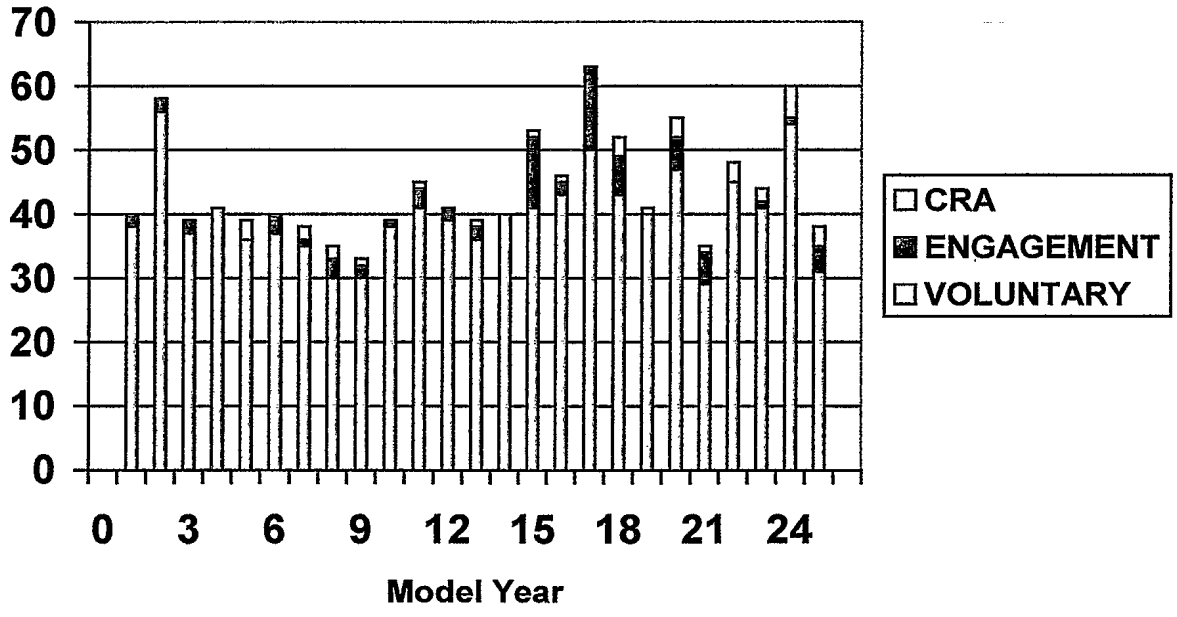

Figure 5: TAS OP Model Total Releases (by Reason Shown)

Years of Service (YOS) Profiles for All Ranks

17. Experience profiles (as measured by Years of Service, YOS) are important indicators of the health of a MOC. Too little experience may be bad for service delivery, while too much experience, particularly at the lower ranks, may be symptomatic of poor succession planning and low morale. Since YOS profiles are "snapshots" of a MOC, it is important to take a look at this measure at various times throughout the 25 year modelling horizon. Figure 6a presents the YOS profile of TAS OP at year 0 (i.e. the current situation by combining NAC OP and OCEAN OP).

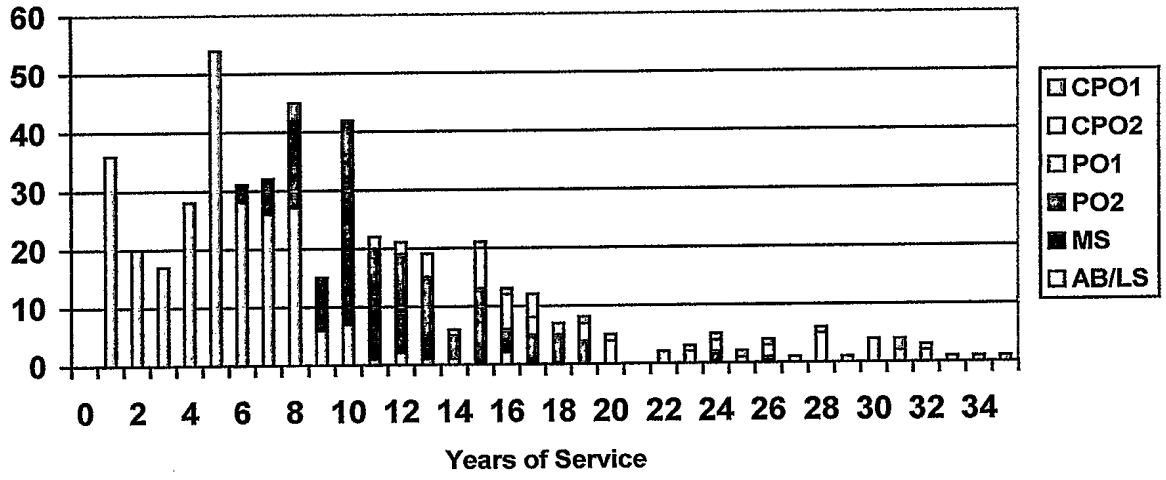

Figure 6a: TAS OP YOS Profile (Year 0)

18. Figure 6b presents the forecast YOS profile of TAS OP at model year 5. The results show a prominent dip in experience levels at 7 and 8 YOS as a result of the dip in intake in model years 2 and 3.

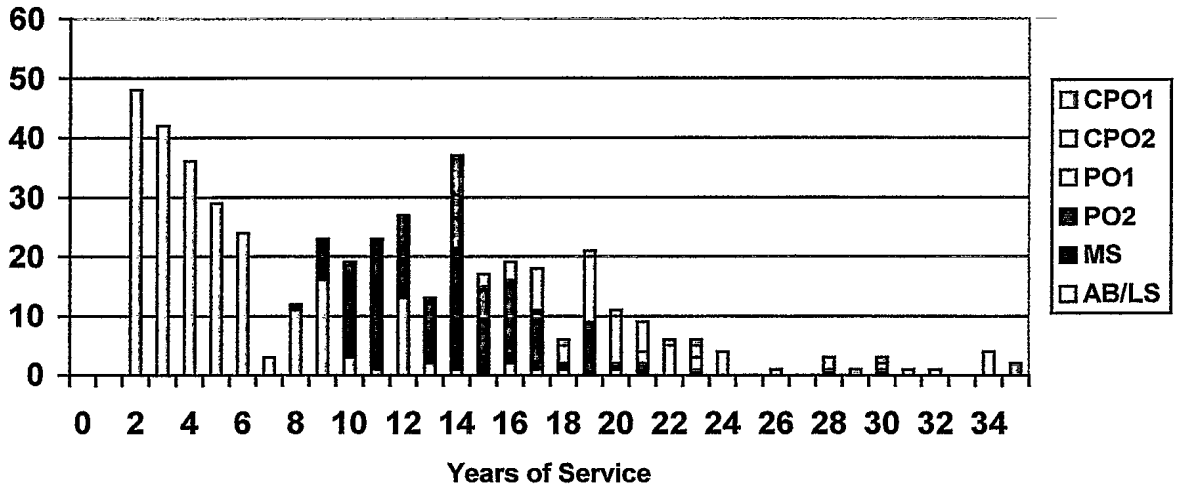

Figure 6b: MOC 722 YOS Profile (Year 5)

19. Figure 6c presents the YOS profile of TAS OP at model year 10. The experience dip is now located at 12 YOS. Another concern is the increasing number of members at high YOS who remain at the LS rank.

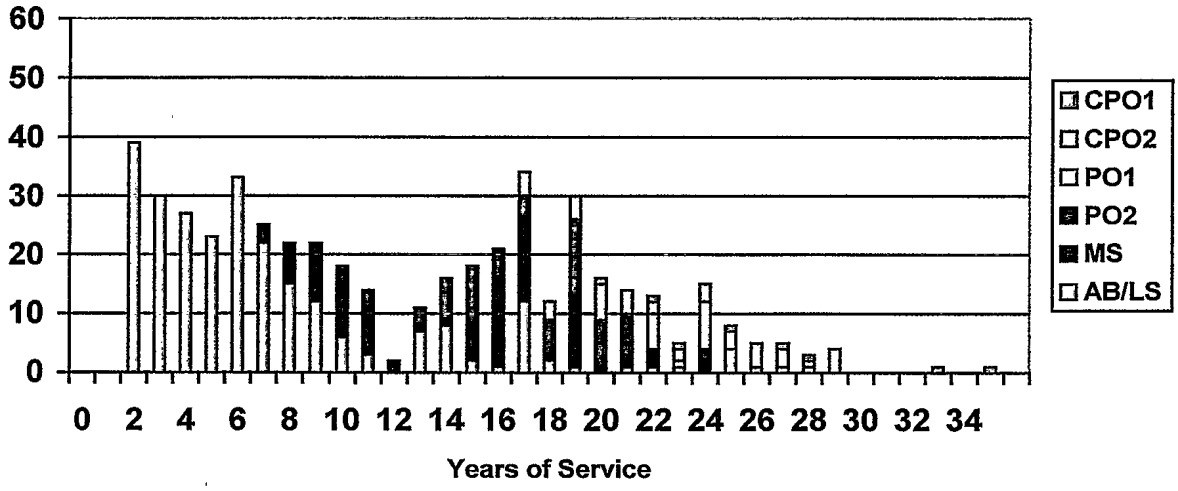

Figure 6c: TAS OP YOS Profile (Year 10)

20. Figure 6d presents the YOS profile of TAS OP at model year 15. The experience dip is now located at 17 YOS and the number of LS members with high numbers of YOS (although reduced from model year 10) remains substantial.

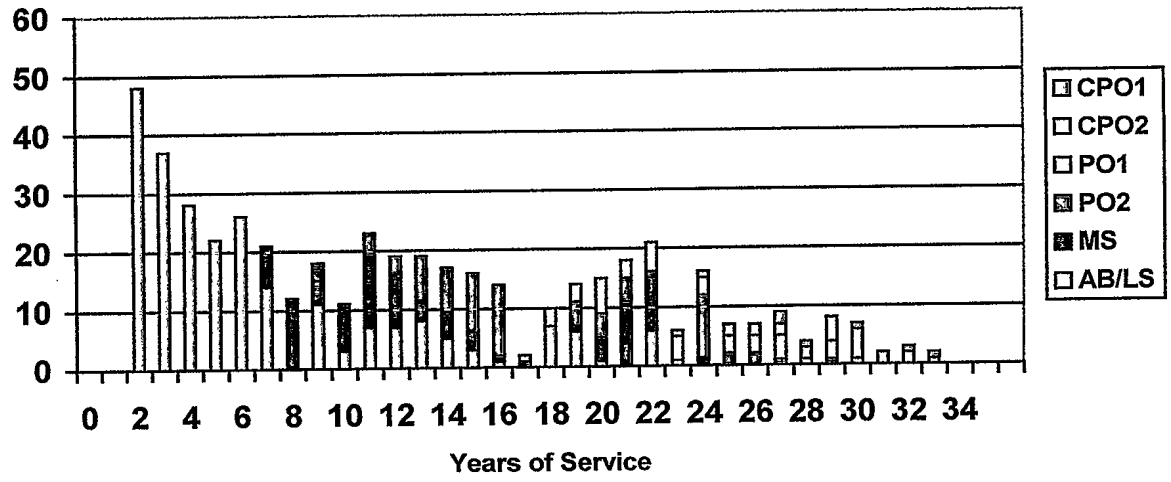

Figure 6d: TAS OP YOS Profile (Year 15)

21. Figures 6e and 6f present the YOS profiles of TAS OP at model years 20 and 25 respectively. The experience distribution is becoming gradually "smoother" in these charts. However, the number of LS members with approximately 20 YOS remains substantial. Therefore, it can be concluded that the TAS OP MOC will have a cadre (i.e. approximately 20 personnel) at the LS rank with approximately 20 YOS – even in the "steady-state".

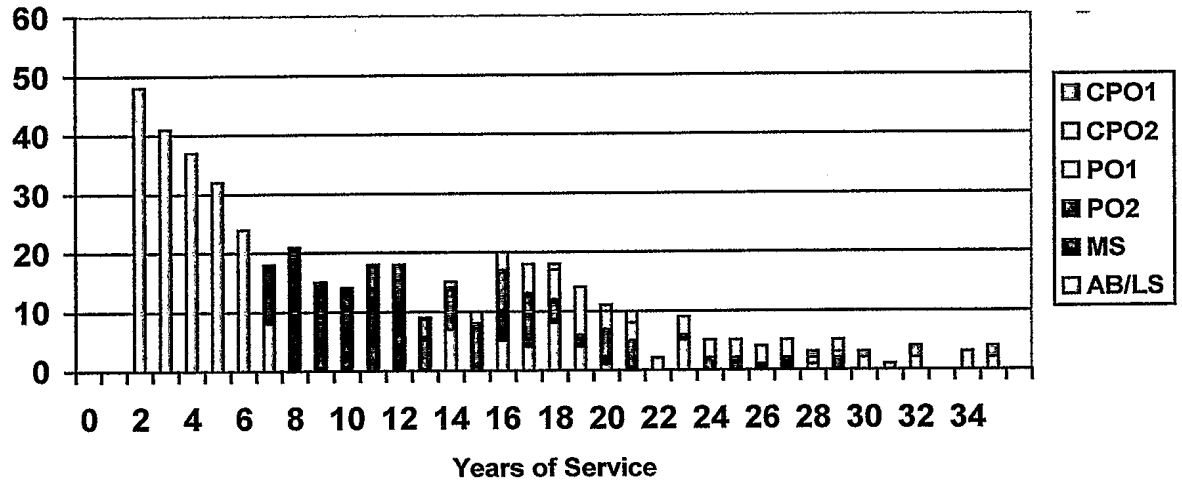

Figure 6e: TAS OP YOS Profile (Year 20)

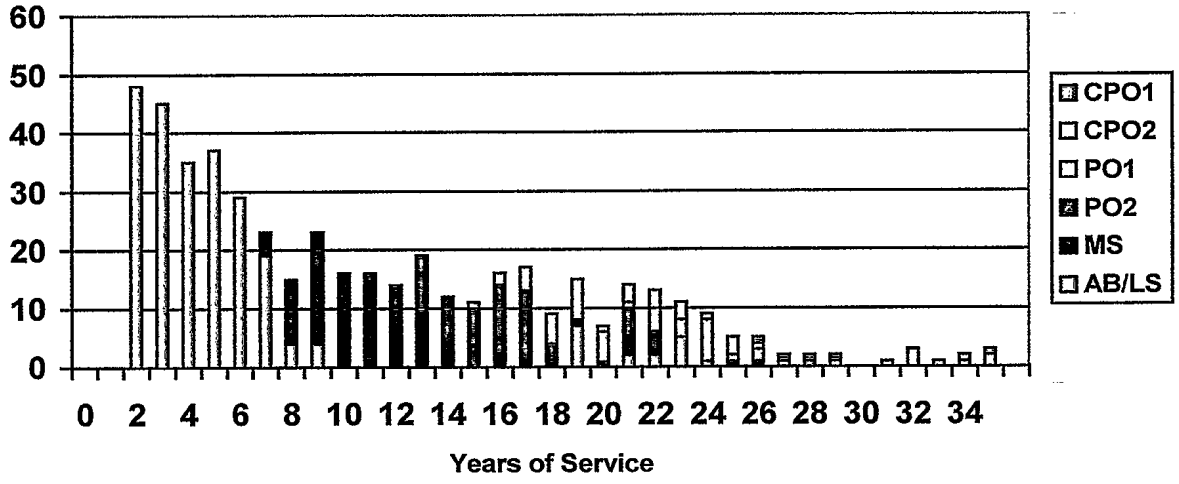

Figure 6f: TAS OP YOS Profile (Year 25)

Time In Rank (TIR) Distribution

22. The time in rank (TIR) distribution of personnel in a MOC is another measure of promotion balance/flow. Healthy promotion flows contribute to keeping TIR numbers relatively low. Large numbers of personnel with high TIR would be symptomatic of structural problems in the MOC. Figure 7 presents the graph of TIR for all ranks at the end of the simulation (i.e. model year 25). In a sense, this represents an asymptotic TIR distribution for TAS OP. For most ranks, the distribution of TIR is quite good, i.e. having most personnel in the 0 to 5 years in rank range. There may be a problem at the LS rank, where there are some personnel with very high TIR values. However, the majority of LS members are still forecast to have between 0 and 5 years in rank.

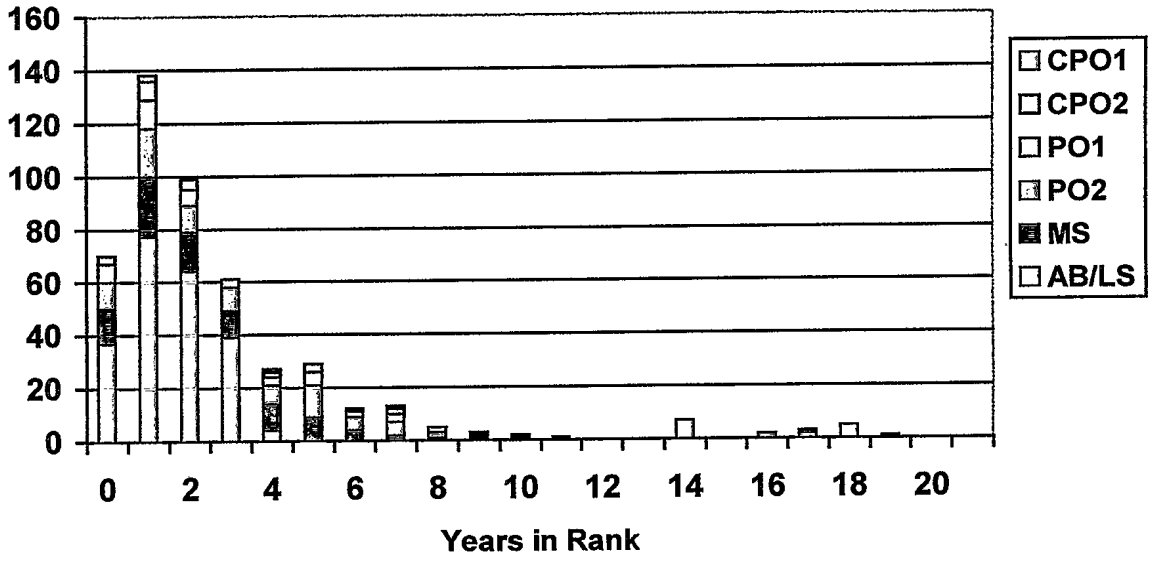

Figure 7: TAS OP Time in Rank Distribution (Model Year 25)

V. SUMMARY AND CONCLUDING REMARKS

23. In support of CMS and the TAS OP OSIP, PORT was requested by DMHRR to develop a HR model of an amalgamation of the NAC OP and OCEAN OP occupations to examine the long-term demographic trends that might affect the viability of this new MOC. Accordingly, a TAS OP model was developed and run in order to help managers assess the "strategic" implications of this restructuring. Modelling results were made available to the client for inclusion as Annex E of the final OSIP report [2]. This paper documents the analysis methodology and highlights some of these results provided to the sponsor.

24. Modelling results suggest that the new TAS OP MOC will be viable despite a scheduled PML reduction. The assumed maximum intake is insufficient to sustain PML in the first few years leading to a temporary shortage in the LS rank. One possible remedial action would be to raise the maximum intake from 48 to approximately 55 in those years where shortages are forecast.

25. TAS OP promotion flows are forecast to be quite variable. A small gap in the occupation's experience profile can be expected to develop, but this will eventually work its way through the system. The TAS OP occupation can be expected to have reasonable release rates and promotion flows as well as a good time in rank distribution. Overall, this MOC is assessed as having acceptable viability.

26. It is difficult to extrapolate the results of this study to other occupations without knowing the details of their particular situation(s). However, the methodology for examining occupational fusion is quite general and flexible. Much of the supporting data for other occupations is available. All that is required to apply this methodology to other occupational fusion studies are inputs related to the end state occupational size and output "measures of effectiveness".

REFERENCES

[1] Email from D Pers Plan to PRT dated 5/27/98.

[2] 5555-31-MOC 278 TAS OP (DMHRR 3-2) dated 16 Feb 1999.

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As a result of Canadian Forces re-engineering, new military occupations (MOCs) are being proposed and approved at an unusual pace and modelling such proposals has become a major activity within the Personnel Operational Research Team (PORT). PORT has developed a family of human resource models to examine the long-term demographic trends that might affect the viability of new MOCs. One such MOC is Tactical Acoustic Sensor Operator (TAS OP), formed by amalgamating the Naval Acoustic Operator and Oceanographic Operator occupations. This work was carried out in support of the Chief of Maritime Staff and the TAS OP Occupational Structure Implementation Plan (OSIP). Modelling results suggest that the new TAS OP MOC will be viable despite a scheduled staff reduction.

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