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**STRATEGIC PERSONNEL MODELLING FOR THE DENTAL CLINIC
ASSISTANT MILITARY OCCUPATION**

By

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Dr A. Jesion**

July 1998

OTTAWA, CANADA

 **National
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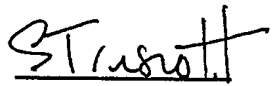
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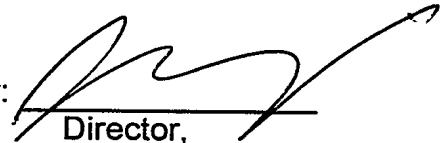
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July 1998



ABSTRACT

The Canadian Forces Dental Service (CFDS) is undergoing significant reengineering as a result of direction to make the CFDS more operationally oriented and cost-effective. A major factor in the evolution of the Dental Branch is the proposal to reinstate the MCPL rank for the Dental Clinic Assistant military occupation (MOC 722) which would accompany a significant reduction in Preferred Manning Levels (PMLs) for this MOC. As a result of concerns about the viability of this MOC after such sweeping change, the Personnel Research Team (PRT) was requested to develop and run a personnel model of MOC 722 to examine the long term effects of these restructuring proposals.

Modelling results suggest that personnel in this MOC are facing significant turbulence as a result of the introduction of the MCPL rank and PML reductions. A "double hump" experience profile is anticipated with relatively low experience levels for the CPL and MCPL rank and relatively high experience levels at the more senior ranks. Promotion chances (to the MCPL rank) fluctuate dramatically over the next two decades. Despite the short term disruptions, the proposed MOC structure is viable and has many desirable characteristics of a healthy occupation.

RÉSUMÉ

Le Service dentaire des Forces canadiennes (SDFC) subit une restructuration importante suite aux directives visant à axer le service davantage sur les activités opérationnelles et à le rendre plus économique. Un élément clé dans l'évolution du Service dentaire consiste à rétablir le grade de caporal-chef dans le GPM 722 - Auxiliaire de clinique dentaire, ce qui serait accompagné d'une baisse importante du niveau de dotation souhaité (NDS) dans ce GPM. Pour répondre aux questions de

viabilité du GPM advenant un changement si radical, l'Équipe de recherche du personnel (ERP) a été chargée de construire un modèle et d'étudier les effets à long terme de la restructuration proposée sur les effectifs du GPM 722.

Les résultats obtenus à partir du modèle du GPM 722 indiquent que si le grade de cplc est rétabli et le NDS baisse, l'effectif dans ce GPM sera fortement secoué. Selon ce modèle, un profil professionnel statistique à "deux bosses" devrait marquer le tableau des effectifs avec les cpl et cplc possédant relativement peu d'expérience et les grades supérieurs beaucoup d'expérience. De plus, les occasions d'avancement (au grade de cplc) fluctueraient énormément au cours des deux prochaines décennies. Cependant, malgré les perturbations engendrées à court terme, la structure proposée serait viable et posséderait les nombreuses caractéristiques positives d'un groupe professionnel sain.

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STRATEGIC PERSONNEL MODELLING FOR THE DENTAL CLINIC ASSISTANT MILITARY OCCUPATION (MOC 722)

I. INTRODUCTION

Background

1. The size and nature of the Dental Clinic Assistant Military Occupation - MOC 722 is changing as a result of re-engineering within the Canadian Forces Dental Service (CFDS). Before 1995, CFDS strength was 650, of whom 590 were uniformed personnel. As a result of direction to make the CFDS more operationally oriented and cost-effective, the CFDS 2000 proposed structure will bring the established strength down to 354, of whom 196 are to be military personnel (Reference 1).

2. Some MOCs such as Dental Laboratory Technician and Dental Hygienist are being eliminated with much of their work to be contracted out. Other MOCs such as Dental Equipment Technician and Dental Administration Officer are being merged with MOCs outside the Dental Branch. The Canadian Forces Dental Service School (CFDSS) at Borden is being downsized and the Director General Dental Services at NDHQ has been merged into the new Director General Health Services Division.

3. Managers within the CFDS are concerned about the numbers of first line supervisors needed to oversee and coordinate the daily support required by Dental Officers and their patients in CFDS clinics. A large number of positions in the Dental Clinic Assistant (DENT CL A) MOC are being converted from military to civilian. This MOC currently has no personnel at the Master Corporal (MCPL) rank. Recruiting occurs at the Corporal (CPL) rank and after a suitable time at this level, individuals can be promoted directly to Sergeant (SGT).

4. As the rest of the Dental Branch is being re-engineered, managers within the CFDS are considering the reinstatement of the MCPL rank for MOC 722 to address the above concerns. This restructuring would accompany a significant reduction in Preferred Manning Levels (PMLs). As a result of concerns about the viability of this MOC after such sweeping change, the Personnel Research Team (PRT) was requested to develop and run a personnel model of MOC 722 to examine the long term effects of these proposals (Reference 2).

5. An Occupational Structure Implementation Plan (OSIP) meeting was held 30 April 1998 to discuss MOC 722. These personnel modelling results were required in advance of that meeting. Reference 3 contains the minutes of this OSIP Meeting.

Aim

6. The aim of this paper is to document the personnel modelling work conducted in advance of the 30 April 1998 OSIP meeting for MOC 722. These results were presented at that meeting.

7. The modelling results for MOC 722 represent some of the background reference material to be reviewed by senior military decision-makers who are responsible for approving a final structure for the CFDS. This modelling support was provided to sponsors as "strategic" input for decision-making with respect to CFDS re-engineering.

Scope

8. The Defence Scientists of the PRT, using attrition information contained in their strategic desktop computer database (Reference 4), developed the model of MOC 722 described in this paper. As a result of limited input information and under 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 "health" of this MOC with respect to the restructuring proposals. Although care was taken to obtain accurate data and to check modelling assumptions with CFDS managers, the results reported here should be regarded as of a preliminary nature.

II. THE GENERIC MODEL (GeM)

A Model Building Utility

9. The analysis reported here was conducted using a specific application of the Generic Model (GeM) utility - a powerful model building environment which has been under continuing development, originally by the Directorate of Manpower Analysis (D Man A) and now the PRT. Originally GeM was developed as a family of executable programs that operated in the OS/2 environment. (See for example References 5 and 6.) GeM now operates in the Windows 95 environment with the use of a Graphical User Interface (GUI). The most recent version of GeM (i.e. version 5) incorporates a visual model building environment as well as model execution animations.

10. The GeM utility is a multifunction tool for building fixed time-step simulation models. Although most of its application has been in Human Resource Management (HRM), the GeM utility is capable of representing a much broader range of modelling situations. GeM is unlike other commercially available simulation design packages. Its main functional components, "nodes" and "links", bear only a superficial resemblance to similar constructs in other packages. It supports object-oriented model design while catering to the dynamic situations typical of expert systems. As a result, model builders using GeM must apply a different way of thinking about model design.

11. A personnel model developed using the GeM environment is a time-stepped simulation of personnel flow through a career management system. The model applies MOC specific career progression, engagement conversion, and attrition rules to a population over a given time horizon. The model also includes MOC - qualified entry, actively (through committed production in the training pipeline) or passively - to sustain PMLs. The changes to the MOC which occur as a result of the application of personnel policies (taking into account related personnel factors such as attrition) are monitored throughout the time horizon and are summarized in the model's output.

12. The GeM methodology can be applied with equal effectiveness to either "tactical" or "strategic" modelling. Indeed models built from GeM components may blur the distinction between these levels of analysis. GeM models have been primarily applied to providing decision-makers with analytical support for policy development as well as for addressing problems associated with management of individual MOCs.

13. GeM models for all Canadian Forces MOCs are under development. For example, recently GeM models have been developed to study policy options with respect to high attrition rates in certain MOCs, the requirement that all officers have a university degree, proposed military departure incentives such the Forces Reduction Plan (FRP), recruitment, and MOC restructuring/reorganization. This paper documents an application of the last of these particular types of analyses.

14. The MOC 722 GeM model was developed and tested over a period of several weeks (at the same time as many other models were being developed). The model can be run satisfactorily on any "modern" Windows 95 compatible personal computer, which has been equipped with GeM 5.

III. METHODOLOGY

The Current DENT CL A Population

15. MOC 722 is currently established for a PML of 162 Non Commissioned Members (NCMs). As modelled, the "current" population of the MOC is 7 personnel below PML (see Table I). Please note that in this MOC there are no MCPL positions at the moment and that entry is at the CPL rank.

Table I
Distribution of MOC 722 Population by Rank

RANK	PML	Staff
CWO	1	0
MWO	3	4
WO	8	8
SGT	41	43
CPL	109	100
PTE	0	0
TOTAL	162	155

The distribution of engagement plans for this population is shown in Table II (on the next page).

Table II
Distribution of MOC 722 Population by Engagement

Engagement Type	Staff
Indefinite Period of Service (IPS)	23
Previous IPS (before ORCDP)	13
Intermediate Engagement (IE)	116
Basic Engagement (BE)	0
Second Basic Engagement (BE2)	3
Continuing Engagement (CE)	0
TOTAL	155

MOC 722: Proposed Establishment Changes

16. The proposed PML distribution for MOC 722 is given in Table III (on the next page). This proposed MOC 722 establishment would see an overall reduction in the number of military positions. In particular, the number of Warrant Officer (WO) positions would be increased by three while the number of SGT positions would be reduced by twelve. The new MCPL rank would be introduced with an establishment of 30 while the CPL establishment would be reduced to 30.

Table III
MOC 722 Proposed PMLs by Rank

RANK	CURRENT PML	PROPOSED PML
CWO	1	1
MWO	3	3
WO	8	11
SGT	41	29
MCPL	0	30
CPL	109	30
PTE	0	0
TOTAL	162	104

GeM Model Assumptions

17. The MOC 722 GeM model contains the following major input assumptions:
- a. the target PML for each rank in time slice 1 is given in column 1 of Table III above. For time slices 2 to 25, the PMLs are as shown in column 2 of Table III;
 - b. minimum/maximum intake (at the CPL rank) is 0/15 for time slice 2 onwards as shown in Table IV below;
 - c. minimum time(s) in rank for promotion are given in Table V below;
 - d. voluntary attrition rates are applied to personnel as shown in Table VI below. These rates are based on historical attrition for MOC 722 in the years 1983 to 1997, (excluding the FRP years);
 - e. promotion probabilities as a function of YOS are as shown in Table VII below. (In consultation with the sponsor, these promotion

probabilities were slightly modified from historical averages in order to better represent proposed promotion policy.);

- f. current engagement type distribution is as shown in Table II previously; and
- g. ORCDP gates/conversion probabilities are shown in Table VIII below.

Table IV
GeM MOC 722 Model Intake Flow

Time Slice	Minimum Intake	Maximum Intake
0	N/A	N/A
1	0 CPL	0 CPL
2 onwards	0 CPL	15 CPL 100% BE

Table V
GeM MOC 722 Minimum Time in Rank Criteria for Promotion

Promotion to:	Minimum Time in Rank (Years)
CWO	2
MWO	3
WO	3
SGT	2
MCPL	2

Table VI
MOC 722 Voluntary Attrition Rates by Rank
(as percentage of population at a YOS level)

YOS	CWO	MWO	WO	SGT	MCPL	CPL	PTE
1	0	0	0	0	0	0	6
2	0	0	0	0	0	0	7
3	0	0	0	0	0	25	7
4	0	0	0	0	6	6	0
5	0	0	0	0	6	6	0
6	0	0	0	0	9	9	0
7	0	0	0	0	4	4	0
8	0	0	0	13	4	4	0
9	0	0	0	0	3	3	0
10	0	0	0	6	2	2	0
11	0	0	0	2	4	4	0
12	0	0	0	4	3	3	0
13	0	0	0	2	6	6	0
14	0	0	0	2	2	2	0
15	0	0	0	0	2	2	0
16	0	0	10	5	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	12	0	11	0
20	0	0	15	4	0	7	0
21	0	0	0	5	100	0	0
22	0	0	0	16	0	0	0
23	0	0	0	0	0	22	0
24	0	8	9	0	0	57	0
25	25	18	14	18	0	0	0
26	0	13	0	6	0	0	0
27	25	25	0	13	0	0	0
28	33	0	25	21	0	100	0
29	0	0	20	38	0	0	0
30	0	0	0	20	0	0	0
31	0	0	20	0	0	0	0
32	0	0	0	50	0	0	0
33	0	0	0	100	0	0	0
34	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0

Table VII
GeM MOC 722 Promotion Probabilities by Rank
(as percentage of population at a YOS level)

YOS	to CWO	to MWO	to WO	to SGT	to MCPL
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	0	0	0	0	2
7	0	0	0	0	7
8	0	0	0	0	5
9	0	0	0	0	14
10	0	0	0	2	16
11	0	0	0	7	14
12	0	0	0	5	5
13	0	0	0	14	11
14	0	0	0	16	7
15	0	0	12	14	5
16	0	0	0	5	7
17	0	0	25	11	5
18	0	0	0	7	0
19	0	0	0	5	0
20	0	0	13	7	2
21	0	0	25	5	0
22	0	0	25	0	0
23	0	0	0	0	0
24	0	0	0	2	0
25	0	14	0	0	0
26	0	28	0	0	0
27	0	14	0	0	0
28	14	0	0	0	0
29	28	14	0	0	0
30	14	14	0	0	0
31	0	14	0	0	0
32	15	0	0	0	0
33	15	0	0	0	0
34	14	0	0	0	0
35	0	0	0	0	0

Table VIII
GeM MOC 722 Model
Assumed ORCDP Conversion Probabilities

Rank	Engagement 1	Engagement 2	Conversion Prob.
MWO,WO	CE	IPS	100%
MWO,WO,SGT	IE	IPS	0%
WO,SGT	IE	CE	0%
SGT, MCPL,CPL	IE	EXT	100%
SGT, MCPL,CPL	EXT	EXT_2	100%
SGT, MCPL,CPL	EXT_2	EXT_3	100%
SGT, MCPL,CPL	BE	IE	10%
MCPL	IE	IPS	100%
MCPL & CPL	IE	CE	100%

IV. MODELLING RESULTS FOR DENT CL A

MOC 722 Deviation from PML

18. 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 MOC 722 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 CPL rank in the first two model years due to insufficient intake. This is followed by a CPL surplus in the next four model years as a result of PML reductions. There is a balance reached after this. There is a smaller surplus in the SGT rank in the first few model years and a small shortfall at this rank in model year 11 (as a result of current population circumstances).

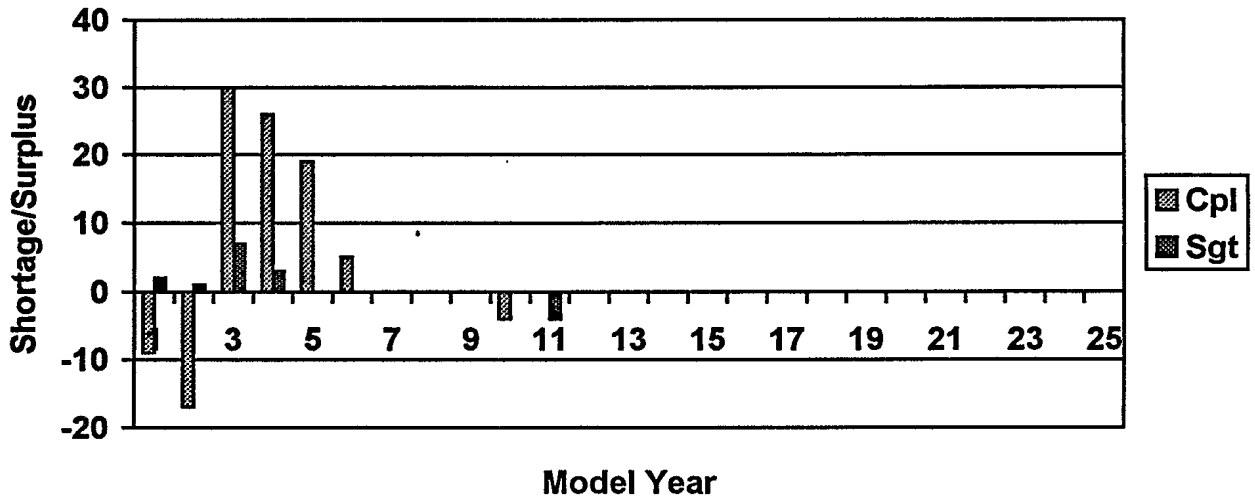


Figure 1: MOC 722 Deviation from PML

MOC 722 Strength by Rank

19. The strength (at each rank) is shown in Figure 2, obtained from running the MOC 722 model over a 25 year period. The X-axis is truncated at model year 10 because results for model years 11 through 25 are identical to model year 10 (i.e. stability has been attained.) The MCPL rank appears in model year 2 (at a strength of 30). By model year 8, the CPL rank is down to 30 as well. The SGT strength drops from an initial value of 43 to a level of 29 by model year 5. The WO strength jumps from 8 to 11 after model year 2. The MWO strength goes from 4 to 3 at model year 1 when the single CWO position is filled.

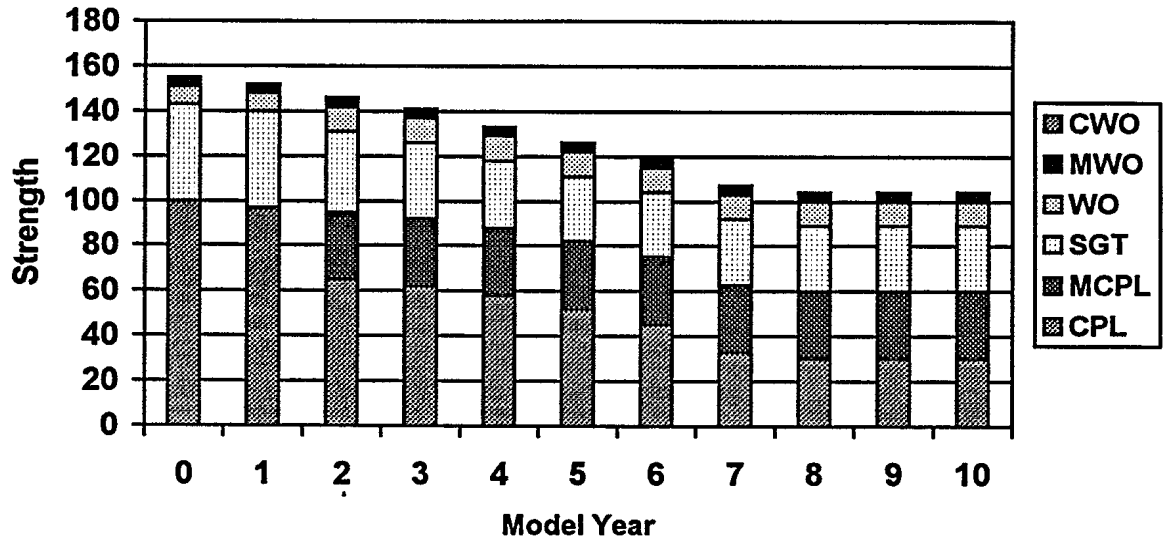


Figure 2: MOC 722 Strength by Rank
(Model Years 11 through 25 are the same as model year 10)

MOC 722 Intake

20. 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. Figure 3 presents the observed intake generated by the GeM model of MOC 722 over a 25 year period. No intake occurs until model year 8. Intake thereafter varies from 4 to 15 (the maximum allowed) over the next 17 model years, averaging approximately 10, all at the CPL rank.

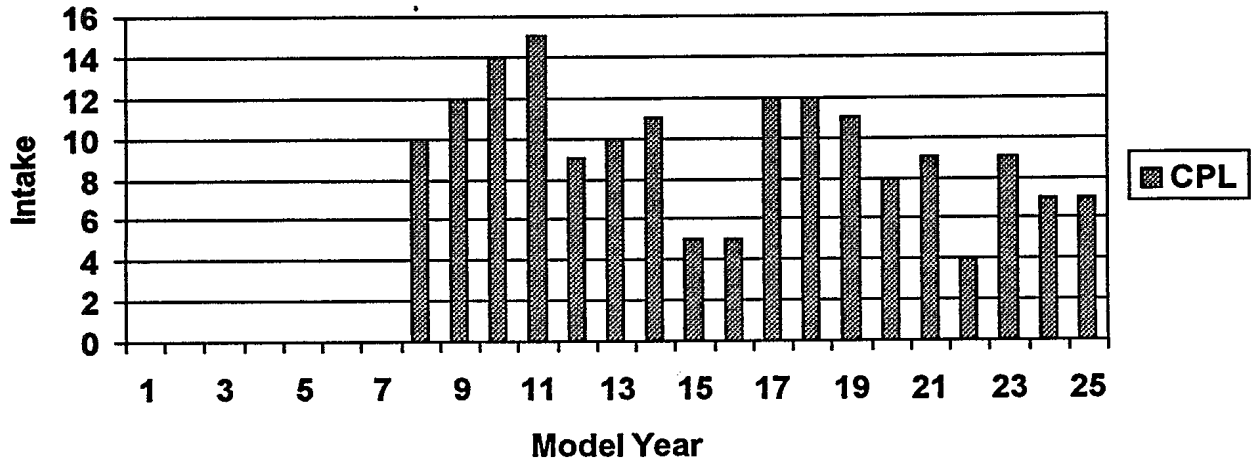


Figure 3: MOC 722 Model Intake Flow

MOC 722 Promotions by Rank

21. 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 GeM MOC 722 model over a 25 year period. There are no promotions to the CPL rank because this is the intake rank. In model year 2, there are 30 promotions to MCPL and thereafter, promotions ramp up from 1 in model year 3 to 12 in model year 10. The average annual number of promotions to MCPL is approximately 6 afterwards. Promotions to SGT resume in model year 5, averaging approximately 4 per year. There are approximately 2 promotions to WO and less than 1 promotion to MWO per year over the model horizon. Over the next several years, these promotion rates might be characterized as "unhealthy" - although they appear to have acceptable long term averages.

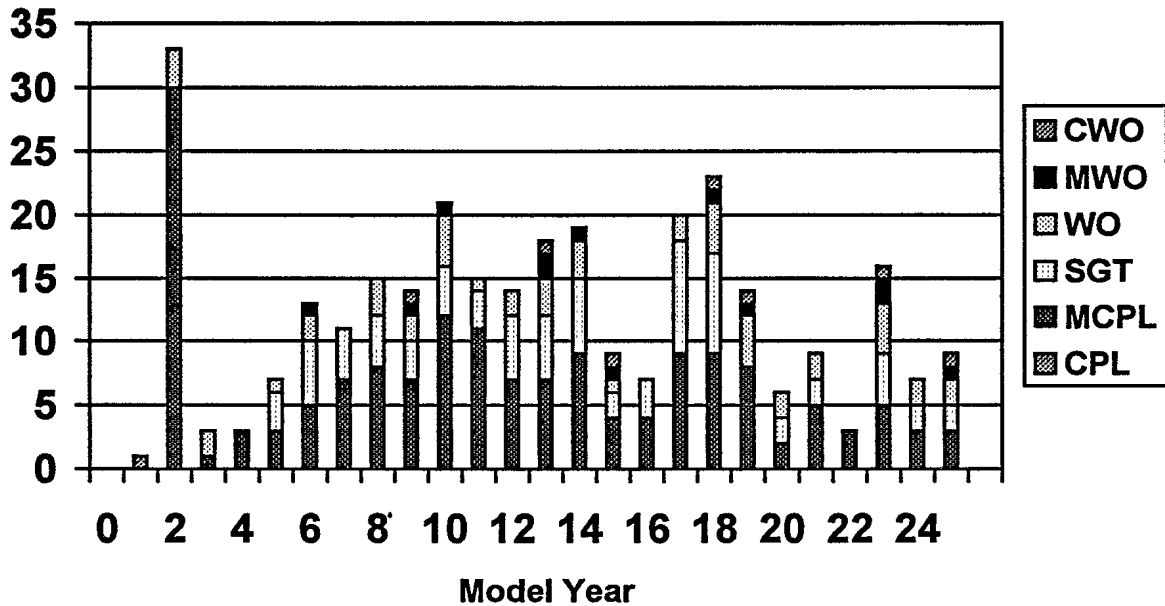


Figure 4: MOC 722 Promotions (into Rank Shown)

MOC 722 Total Releases

22. 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 GeM MOC 722 model over a 25 year period. Voluntary releases dominate, ranging from 3 to 15 over the timeframe modelled and averaging approximately 8 per year. Personnel reaching Compulsory Retirement Age (CRA) average less than one per year. The same is true for engagement releases. Overall, release rates are probably not unacceptable, but the "higher" release rate observed in model years 7 to 11 may be symptomatic of problems on the horizon.

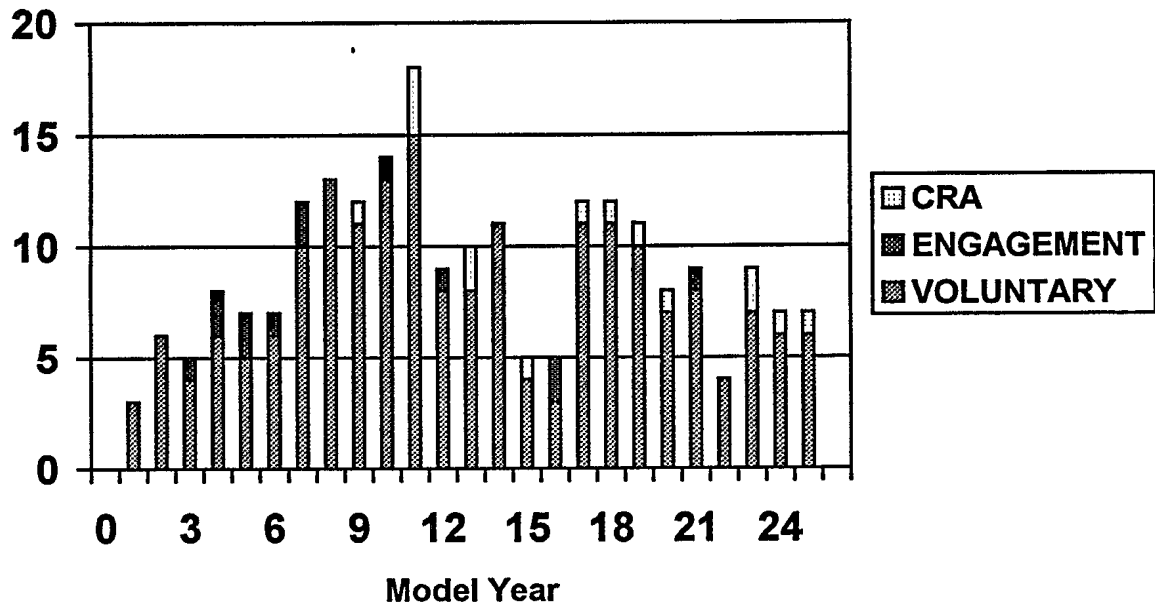


Figure 5: MOC 722 Total Releases (by Reason Shown)

MOC 722 Years of Service (YOS) Profiles for All Ranks

23. 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 MOC 722 at year 0 (i.e. the current situation with no MCPL population). The experience levels of most current personnel fall into the 6 to 17/18 YOS range, with a gradual decline in numbers at higher YOS.

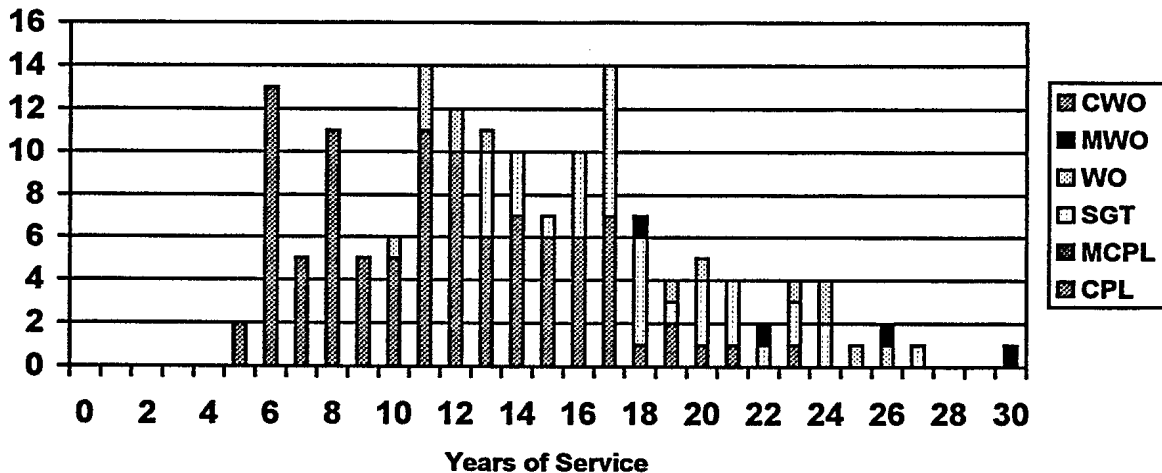


Figure 6a: MOC 722 YOS Profile (Year 0)

24. Figure 6b presents the YOS profile of MOC 722 at year 5. The results show a movement of the YOS bulge from the 6 to 17/18 YOS region to the 10 to 22 YOS region. This is indicative of an aging population as a result of the lack of recruitment over the intervening 5 year period.

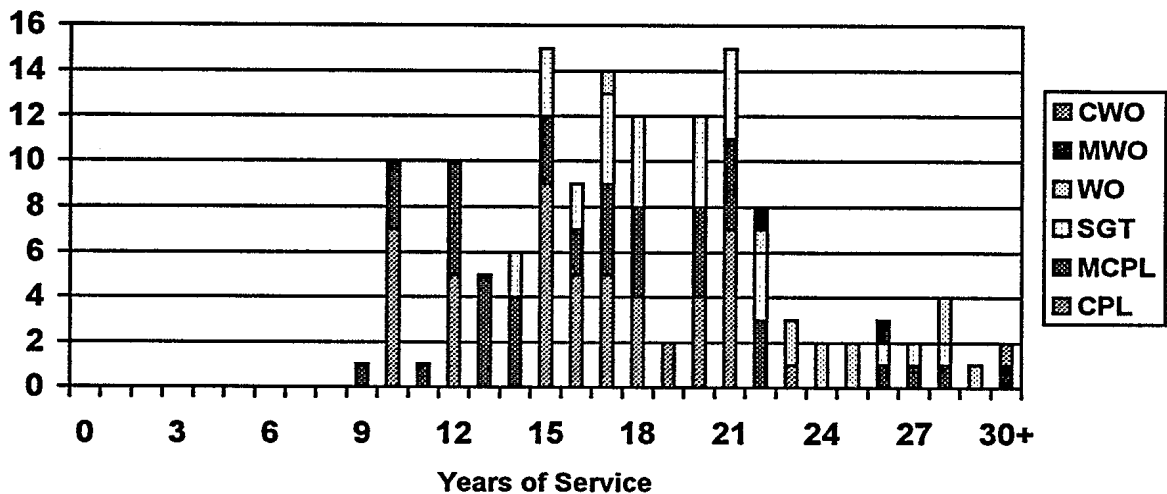


Figure 6b: MOC 722 YOS Profile (Year 5)

25. Figure 6c presents the YOS profile of MOC 722 at model year 10. The results show that intake has now resumed and that a new bulge in experience levels is forming at low YOS levels. The previous YOS bulge has diminished, but remains in the region between 15 and 22 YOS.

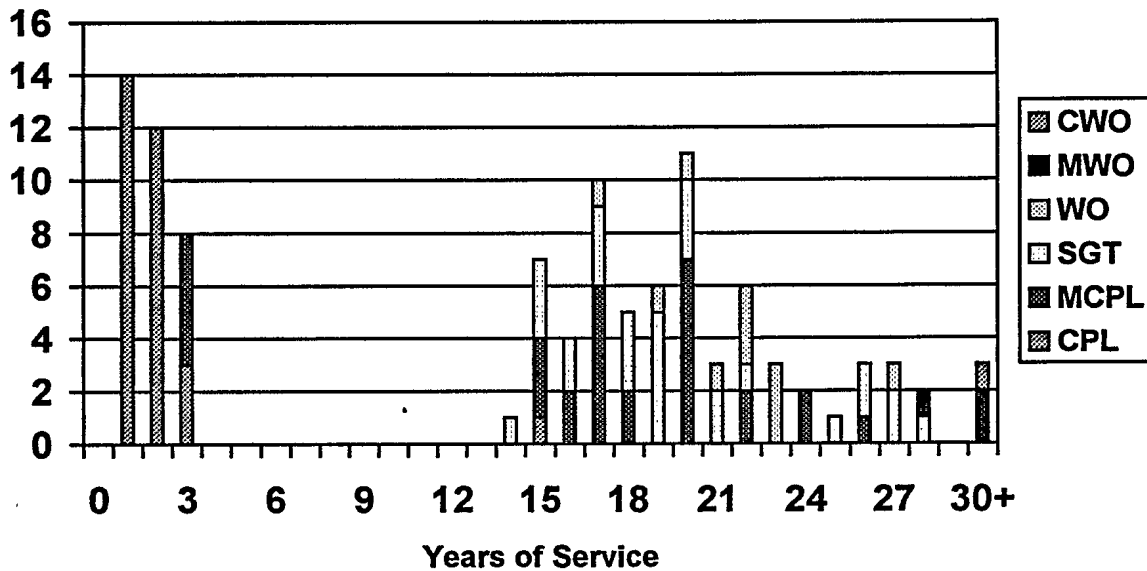


Figure 6c: MOC 722 YOS Profile (Year 10)

26. Figure 6d presents the YOS profile of MOC 722 at year 15. The results show that a "double hump" structure has formed with relatively low experience levels for the CPL and MCPL rank, while the population at the higher ranks has a relatively high experience level. The ten year "valley" in experience levels is a direct result of having no intake in this MOC for model years 1 to 8. Please note that most personnel at the SGT rank were recruited before the intake freeze.

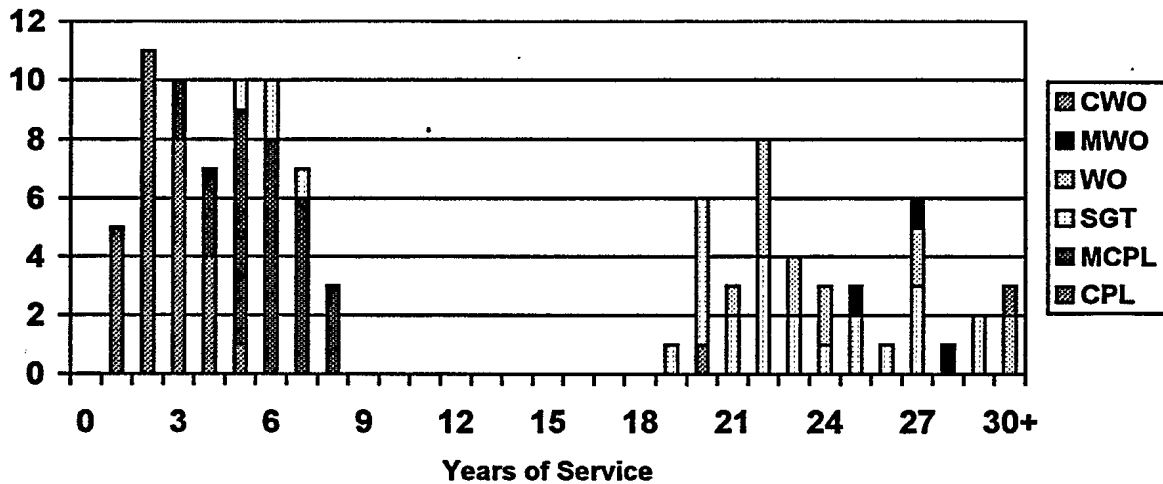


Figure 6d: MOC 722 YOS Profile (Year 15)

27. Figure 6e presents the YOS profile of MOC 722 at year 20. The results continue to show a "double hump" structure in experience levels, with the higher experience bulge greatly reduced. At the SGT rank, the majority have now "crossed over to the younger generation" (i.e. those coming into the MOC after the intake freeze). A few of these "post-freeze personnel" have made a quick progression to WO, although the majority of the most senior ranks are still from the "pre-freeze generation".

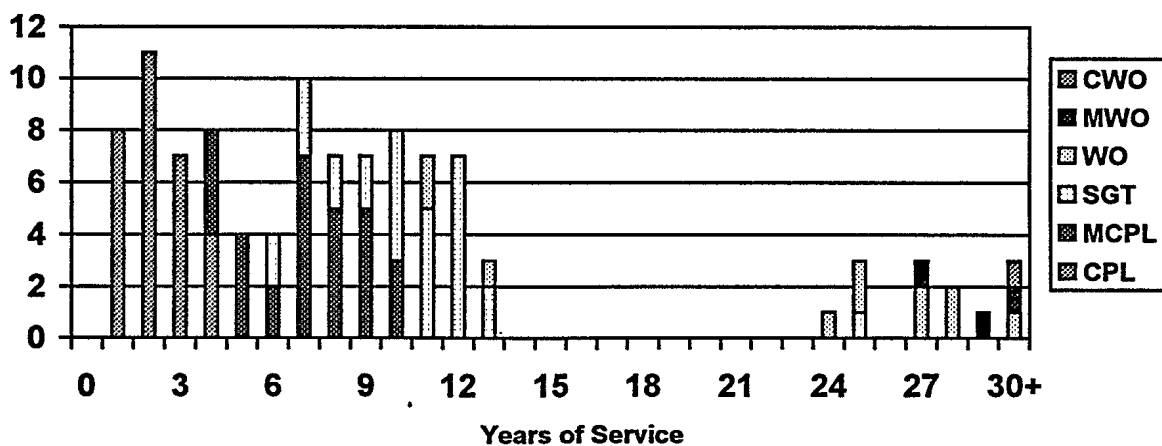


Figure 6e: MOC 722 YOS Profile (Year 20)

28. Figure 6f presents the YOS profile of MOC 722 at year 25. The results now show a more "youthful" YOS profile, except that all four personnel at the MWO/CWO ranks are still from the "pre-freeze generation". With their releases, the MOC will have come through the intake freeze completely. However, if the model were to be run over a longer timeframe, a "boom-bust-echo" pattern would emerge, as the majority of personnel who followed the intake freeze begin to leave in significant numbers.

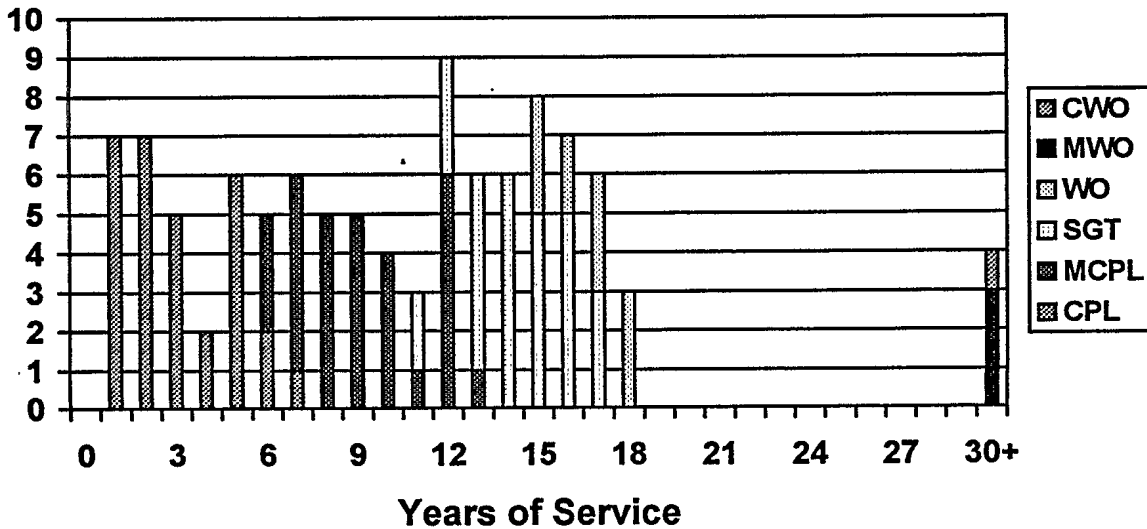


Figure 6f: MOC 722 YOS Profile (Year 25)

29. Thus, this MOC can be expected to suffer through a prolonged period of turmoil with respect to experience levels. That is, after reducing intake to zero for approximately ten years, the MOC will first show the characteristics of an aging population, followed by an intake "boom" which will lead to severely reduced experience levels in most ranks.

MOC 722 Average Time In Rank (TIR)

30. The average time in rank (TIR) of personnel at their promotion is a measure of how well balanced the MOC promotion flow is at any given time. Consistency in this measure is desirable from a morale and succession planning point of view. Figure 7 presents the graph of average TIR (at promotion) for the MCPL and SGT ranks over the 25 year model timeframe. For the MCPL rank, TIR fluctuates wildly, ranging from approximately 2 or 3 (during model years 11 to 17 when promotions are very rapid) to 18 at model year 9. This drop in average TIR at promotion (consistent with the observed experience levels discussed above) is unhealthy for the MOC with respect to service delivery. The average TIR at promotion for the SGT rank is much more consistent.

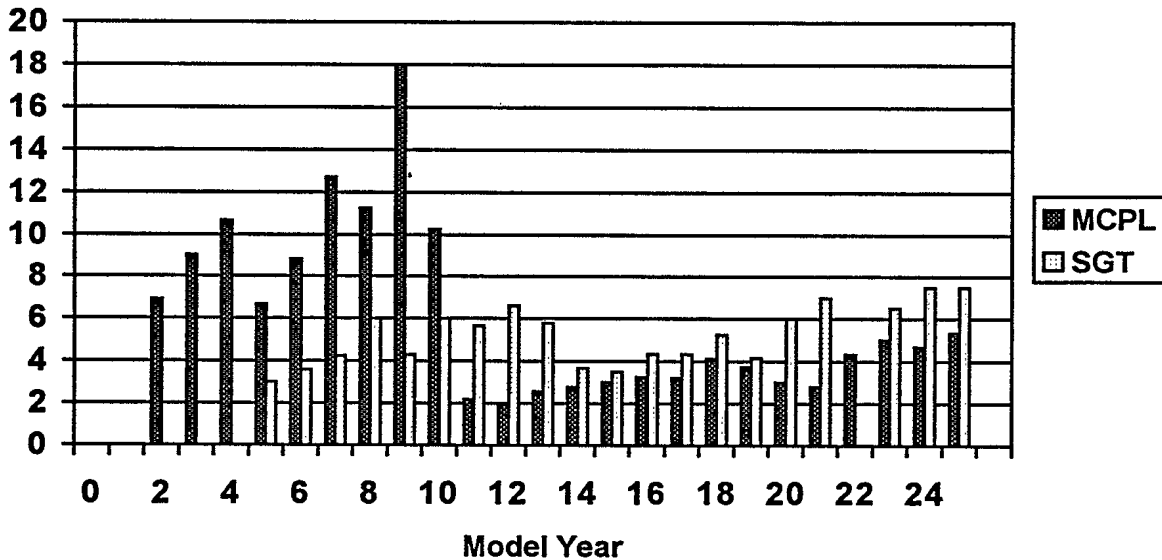


Figure 7: Average Time in Rank at Promotion (to MCPL & to SGT)

V. SUMMARY AND CONCLUDING REMARKS

31. The CFDS is conducting a major re-engineering exercise which includes restructuring the Dental Clinic Assistant MOC 722. Modelling support was requested in order to help managers assess the "strategic" implications of this restructuring. This paper documents the analysis methodology and results provided to personnel decision-makers responsible for CFDS re-engineering.

32. Introduction of the MCPL rank, reductions in PMLs, and the resulting 8 year intake freeze will all contribute to disruptions in this MOC. Modelling results suggest that a "double hump" experience profile will form within a decade with relatively low experience levels for the CPL and MCPL rank and relatively high experience levels at the more senior ranks. Promotion chances (to the MCPL rank) will fluctuate dramatically as the effects of the intake freeze wear off. Eventually, the MOC will return to a balanced situation, but this will take decades.

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The Canadian Forces Dental Service (CFDS) is undergoing significant reengineering as a result of direction to make the CFDS more operationally oriented and cost-effective. A major factor in the evolution of the Dental Branch is the proposal to reinstate the MCPL rank for the Dental Clinic Assistant military occupation (MOC 722) which would accompany a significant reduction in Preferred Manning Levels (PMLs) for this MOC. As a result of concerns about the viability of this MOC after such sweeping change, the Personnel Research Team (PRT) was requested to develop and run a personnel model of MOC 722 to examine the long term effects of these restructuring proposals.

Modelling results suggest that personnel in this MOC are facing significant turbulence as a result of the introduction of the MCPL rank and PML reductions. A "double hump" experience profile is anticipated with relatively low experience levels for the CPL and MCPL rank and relatively high experience levels at the more senior ranks. Promotion chances (to the MCPL rank) fluctuate dramatically over the next two decades. Despite the short term disruptions, the proposed MOC structure is viable and has many desirable characteristics of a healthy occupation.

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