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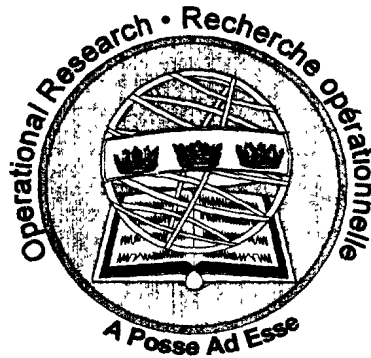
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DEPARTMENT OF NATIONAL DEFENCE
CANADA



OPERATIONAL RESEARCH DIVISION
DIRECTORATE OF OPERATIONAL RESEARCH (JOINT & LAND)

DOR(J&L) RESEARCH NOTE RN 2000/11

GOLD WARDER
Land Force Transformation Project:
Preliminary Analysis of Sustainability Issues

BY

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DECEMBER 2000

OTTAWA, CANADA



OPERATIONAL RESEARCH DIVISION

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GOLD WARDER



1999-2000

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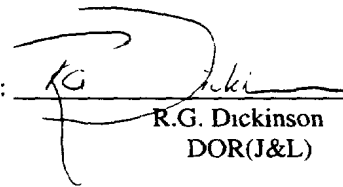
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OTTAWA, ONTARIO

DECEMBER 2000

ABSTRACT

In October 1999, the Operational Research Division was tasked to provide OR support to the Canadian Land Staff Army Restructuring Initiative. This research, referred to as GOLD WARDER, initially focussed on the current Army's capability to sustain foreign deployments based on historical demands. This project was suspended, awaiting further direction, after preliminary results revealed that other issues needed to be resolved beforehand. The aim of this Research Note is to document the preliminary analysis of sustainment issues in support of deployed operations. It is recommended that a comprehensive study be undertaken to address the issues identified in this report.

RÉSUMÉ

Au mois d'octobre 1999, la Division de la Recherche Opérationnelle a été mandaté de fournir un appui analytique à l'initiative de restructuration des Forces terrestres initiée par le Chef de l'état-major de l'Armée de terre. Cette étude, surnommée "GOLD WARDER", s'est penché sur la capacité de l'Armée de terre à maintenir de façon continue les opérations déployées. Le projet a été suspendu à la suite de résultats préliminaires nécessitant la résolution de questions additionnelles. Ce rapport documente l'analyse préliminaire des questions relatives au maintien continu des opérations déployées. Il est recommandé qu'une analyse plus compréhensive soit menée afin de répondre aux questions soulevées dans ce rapport.

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LIST OF ABBREVIATIONS

ATWG	Army Transformation Working Group
CFTP	Canadian Forces Tasking Program
CLS	Chief of Land Staff
CSS	Combat Service Support
DGOR	Director General Operational Research
DLFR	Director(ate) Land Force Readiness
DLSP	Director(ate) Land Strategic Planning
DOR(J&L)	Director(ate) Operational Research (Joint and Land)
IRF(L)	Immediate Reaction Force (Land)
LSWG	Land Staff Working Group
MCF	Main Contingency Force
MOC	Military Occupation Classification
OOTW	Operations Other Than War
ORD	Operational Research Division
PML	Preferred Manning Level
QOL	Quality of Life

ACKNOWLEDGEMENTS

The production of this project report was the collective effort of a team of defence scientists and military advisors. Particular recognition is offered to the following, without whose assistance this report would not have been possible: Colonel WN Peters, DLSP; LCol S. Bryan, DLSP 5; Maj EG Campbell, DLFR 3-9, Maj KW Ferris, J1 Coord 3; Capt LE Cooper, J1 Coord Manning; and MWO M. Hladik, DLFR 3-9-3-2.

GOLD WARDER

LAND FORCE TRANSFORMATION PROJECT:

PRELIMINARY ANALYSIS OF SUSTAINABILITY ISSUES

I. INTRODUCTION

BACKGROUND

1. DND, like most government departments, is faced with reduced and limited funding. In order to meet the Government mandate to reduce spending, the Canadian Forces are constantly searching for economies and efficiencies. The areas of focus are the traditional categories of procedures, personnel and capital. Each of these categories has possibilities for savings. However, a saving in one area often has cause and effect on the others.
2. Environmental Chiefs within DND are faced with changes forced by Departmental constraints and limitations. The Chief of Land Staff (CLS) began the current review process in March 1998 (Reference 1). Initial guidance and subsequent direction led the Army to seek reductions in personnel through reorganisation of traditional formation structures (Reference 2). Under this direction the Land Staff proposed five field force structures for consideration. The Director of Land Strategic Planning tasked the Operational Research Division (ORD) to assist with the analysis of the proposed structures. This OR project was referred to as GOLD WARDER.
3. In response, ORD prepared two approaches. The first was a capability-based analysis employing a modelling tool known as H-FRAME (Reference 3). The purpose of this study was to analyse the capability of each structure against the missions and tasks assigned to the Army. While this analysis was underway, the Land Staff reduced the number of options to two similar structures and redirected ORD to suspend the H-FRAME analysis as it was felt the analysis would show little difference between the options. Although this study was not completed, a report was written that documented the initial work that linked potential Army tasks to the departmental scenarios (Reference 4).

4. The purpose of the second approach was to analyse the capacity of the proposed structures to sustain operations. This research initially focussed on the current Army's capability to sustain foreign deployments based on historical demands. This project was suspended, awaiting further direction, after preliminary results revealed that other issues needed to be resolved beforehand.

AIM

5. The aim of this Research Note (RN) is to document the preliminary analysis of sustainment issues in support of deployed operations.

OBJECTIVES

6. The objectives of the research were to:
- a. Determine the Army's historical foreign deployment demands;
 - b. Determine how successful the Army has been at satisfying its foreign service demands;
 - c. Determine if particular MOC/rank groups need special attention when proposing a new force structure; and
 - d. Provide recommendations as appropriate.

II. METHODOLOGY

CF MISSIONS

7. In order to analyze sustainability issues within the Army, the missions and tasks performed by the Army must be known. These can broadly be grouped under three distinct categories: domestic demands, international collective defence commitments, and foreign deployments.

8. **Domestic Demands.** Domestic demands are wide ranging. Included in this category are the defence of Canada as well as recent operations such as the ice storm, the Manitoba floods, Y2K, and others. The Army plans for a brigade group to be available for domestic operations. In reality and considering the pressures from fellow countrymen, the Army and the CF are obliged by the Government to provide whatever and as much as is available depending on the demand.

9. **International Collective Defence Commitments.** For decades, the Army has planned and organised for international commitments. The end of the Cold War changed the scope of this process but it continues as an Army mainstay. Principal among today's international collective defence commitments are the Immediate Reaction Force (Land) (IRF(L)) and the Main Contingency Force (MCF). In terms of preparations, international commitments are planned structures and are reliant on specific lead times.

10. **Foreign Deployments.** Foreign deployments are those taskings that deploy Army personnel to peace support operations or similar commitments. This type of tasking has been increasing in the past decade and its impact is magnified by force reductions. When considering the sustainability of a foreign deployment the Army has identified the need for a 5:1 planning ratio to satisfy CF directives concerning Quality of Life (QOL), morale and other personnel issues. The 5:1 ratio refers to the availability of five units for every deployed unit or five suitable candidates for every deployed position. This 5:1 ratio was the basis for the new force structures to have 10 manoeuvre units, allowing the CF to deploy and sustain two manoeuvre elements simultaneously. Forecasting the demands for foreign deployments has been consistently difficult.

OR STUDY FOCUS

11. From a CF sustainability perspective, foreign deployments are the most frequent type of operation and currently represent the greatest challenge. It was decided that OR would focus on this issue to determine which factors affect sustainability and recommend avenues for further study. The first step in the analysis was therefore to focus on historical data from foreign deployments. CF practice is to deploy forces that are task-tailored for the mission. Although units are designated for deployments, many members of the unit are unavailable for deployment for various reasons including medical waivers, Quality of Life (QOL) issues or have already participated in a recent deployment. For longer operations, six-month rotations are planned to sustain the mission. To assist in tracking deployed personnel and identifying those to be deployed, the Army developed the Canadian Forces Tasking Program (CFTP) (Reference 5). The CFTP is a management tool originally created in 1990 for the Army but now used by the CF that

- a. links deployed personnel to CF operations;
- b. initiates the operational taskings;
- c. records the qualifications required for each position (Position Database);

- d. tracks the request through the command chain; and
- e. records the qualifications of the selected individual (Nomination Database).

12. One of the main problems identified in discussions with J1 Coord (the agency responsible for manning operational tasks) was the availability of individuals rather than units and in particular the availability of personnel on their "Endangered Species List" (ESL). The ESL is a list of MOCs including rank and qualifications that are currently in short supply for deployment. Consequently, the OR study focused its preliminary efforts on those MOCs that met all of the following criteria:

- a. were on the current ESL;
- b. were deployed consistently over the period under study; and
- c. were large enough to provide meaningful results.

13. The preliminary MOCs chosen were:

- a. MOC 041 – Field Engineer (FD ENGR);
- b. MOC 211 – Radio Operator (RAD OP); and
- c. MOC 811 – Military Police (MP).

III. ANALYSIS

DATA COLLECTION PROBLEMS

14. The following assumptions and limitations were made to facilitate the data analysis:

- a. Data used to support the analysis was limited to that obtained through the CFTP Query interface. Although the CFTP is now a CF wide management tool, it may not capture all CF taskings dating back to when it was first introduced as an Army tool;
- b. Data from the position database was restricted to hard MOCs; and
- c. Time constraints did not allow the analysis to be restricted to foreign deployments; hence all taskings captured in the CFTP were used.

ANALYSIS ISSUES

15. In the course of the analysis it became apparent that the sustainability issue could be addressed using two approaches: daily or rotational demand. For instance consider a one-year tasking where the individual is rotated after six months. This tasking would identify a requirement for one individual using the daily demand method and two individuals using the rotational demand method. Both approaches will be presented.

DAILY DEMAND ANALYSIS

Requirements for Field Engineers – MOC 041

16. Results of the analysis of the demand for field engineers from the CFTP are summarized in Table 1. This analysis reveals that there is a considerable fluctuation in the annual demands ranging from an average of 92 in 1995 to a high of 174 in 1999. There is also considerable fluctuation throughout any given year as illustrated in Figure 1 for the 1999 fiscal year. This would make it difficult to rely on historical patterns to predict future demands for an MOC.

TABLE I
MOC 041 Field Engineer Historical Demand - FY 91/92 to FY 99/00

Fiscal Year	Avg	STD	Min	Max	Percentile		
					50%	80%	90%
1999	174.2	38.5	67	234	183	207.2	221.4
1998	96.9	27.0	62	138	87	127.6	134
1997	106.7	31.7	77	212	94	124.6	154
1996	110.8	28.8	66	218	105	132.6	156
1995	92.0	50.8	8	170	99	142.4	164.6
1994	116.1	36.0	82	214	99	143.4	180
1993	128.8	52.6	39	216	126	189	194.8
1992	171.7	32.2	64	215	173	204	205
1991	104.5	66.8	5	181	134	172.6	178.8
1991-1999	122.4	51.0	5	234	114	173	189

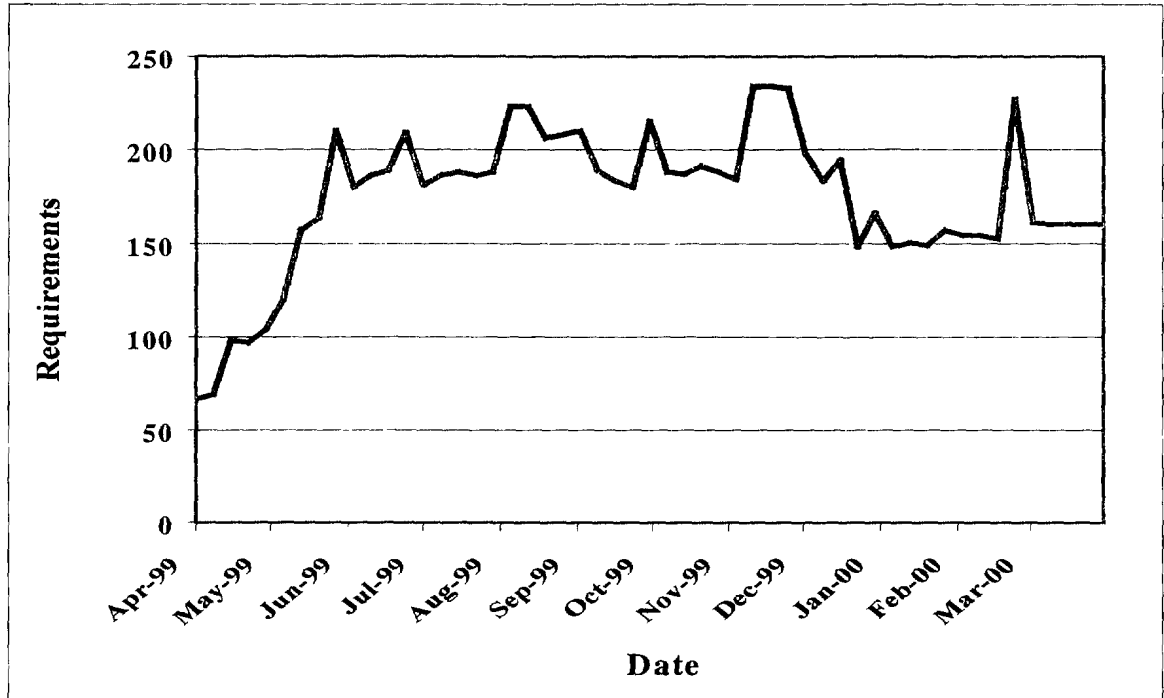


Figure 1: MOC 041 Field Engineer Demand Graph for FY 99/00

17. **Application of the 5:1 rule.** Given the fluctuations in demand, it would be very difficult to predict the number of deployed positions that would need to be filled. If this approach was to be pursued the CF would have to choose a planning number based on the historical demand with an associated risk factor. For example the CF could base its force structure around the ability to satisfy 80% of the historical requirements. The risk factor would indicate the likelihood of demands exceeding this planning number. In situations where the demand is greater than this ceiling, the CF would have to relax the deployment policies, deploy members out of MOC, use the reserve force or employ other strategies to satisfy the demand.

Field Engineer Deployments

18. Analysis of deployment data indicates that the number of engineers deployed does not correspond to the demand. Figure 2 illustrates this difference by superimposing the deployments of field engineers on their demand for fiscal year 1999. The deployments are consistently below the demand. This suggests that either these positions are not being filled or that they were filled by members from another MOC.

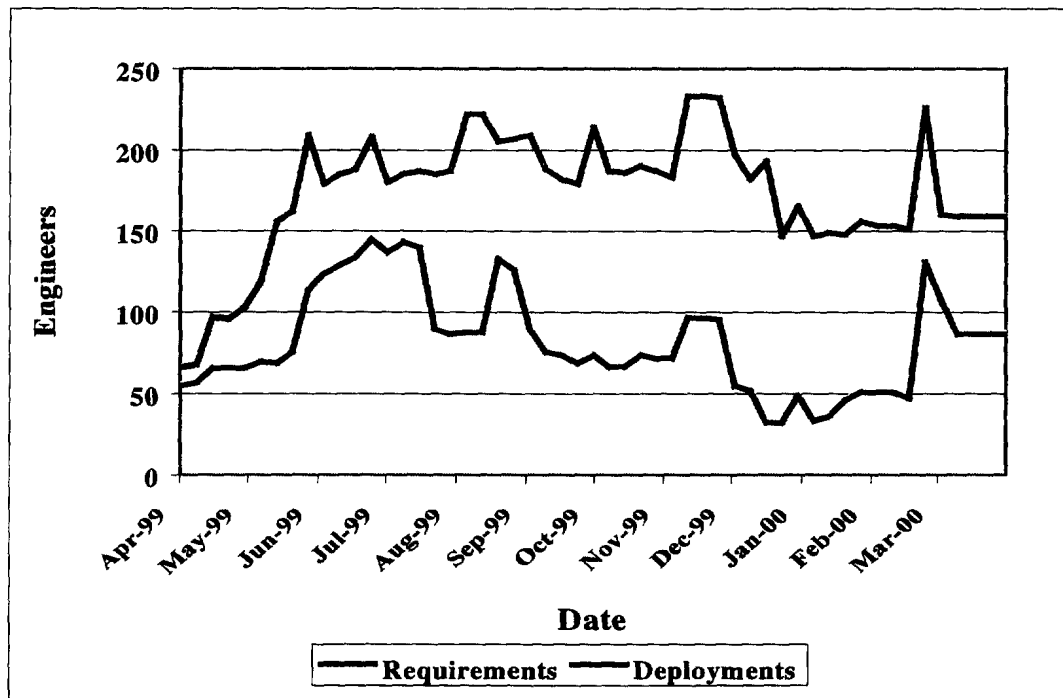


Figure 2: MOC 041 Field Engineer Demand vs Deployment for FY 99/00

Analysis of MOC 211 – Radio Operators

19. The historical demand for Radio Operators is shown in Table II and the comparison between deployments vs demand is illustrated in Figure 3. Figure 3 shows that in some periods the number of radio operators deployed exceeded the demand. This means that radio operators were filling positions that did not specifically require the skills of a radio operator. These positions were either generic where MOC 211 was eligible or positions where MOC 211 was not specifically required.

TABLE II

MOC 211 Radio Operator Historical Demand – FY 91/92 to FY 99/00

Year	Avg	STD	Min	Max	Percentile		
					50%	80%	90%
1999	135.5	30.4	81	187	128	164.2	179.2
1998	81.5	10.0	69	118	79	91	91.8
1997	78.8	15.0	61	112	78	98	98
1996	130.4	35.6	67	255	144	147	147
1995	81.5	33.2	36	145	73	116.8	140.8
1994	136.0	70.3	63	220	83	210	219.6
1993	77.9	26.5	31	132	65	110.6	120.8
1992	85.6	27.2	56	135	79	124	127.4
1991	56.4	19.8	35	89	47	79.6	83.6
1991-1999	96.0	43.8	31	255	79	139.4	149.6

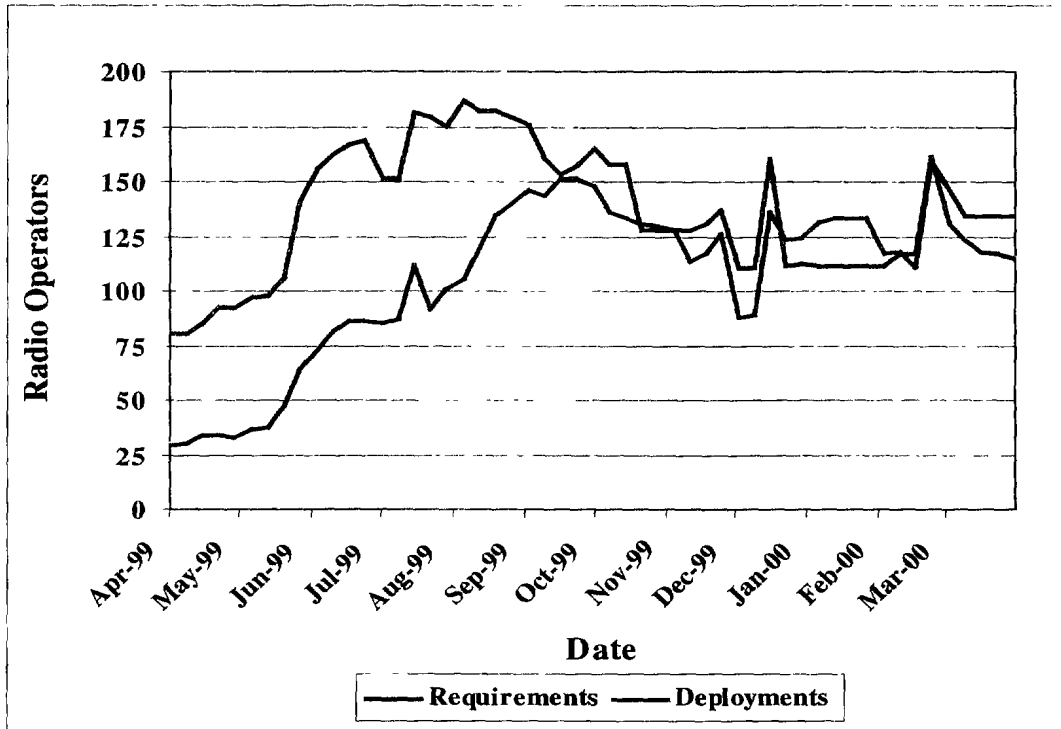


Figure 3: MOC 211 Radio Operator Demand vs Deployment for FY 99/00

Analysis of MOC 811 – Military Police

20. The historical demand for Military Police is shown in Table III and the comparison between deployments vs demand is illustrated in Figure 4. Figure 4 shows that similar to MOC 211, the number of deployed personnel at times exceed the demand.

TABLE III

MOC 811 Military Police Historical Demand – FY 91/92 to FY 99/00

Year	Avg	STD	Min	Max	Percentile		
					50%	80%	90%
1999	97.6	23.7	30	151	99	112	115.8
1998	33.5	8.4	25	54	31	42.2	45
1997	47.9	17.0	24	76	49	66	66.8
1996	88.6	25.4	26	145	70	107	122
1995	28.1	8.9	8	43	29	35.2	40.4
1994	39.2	8.8	22	57	37	46	53.2
1993	32.1	9.8	18	58	30	36	47
1992	32.8	14.9	18	69	26	43.6	54.4
1991	28.1	17.0	13	78	22	35	51.6
1991-1999	47.5	29.8	8	151	35	67	105

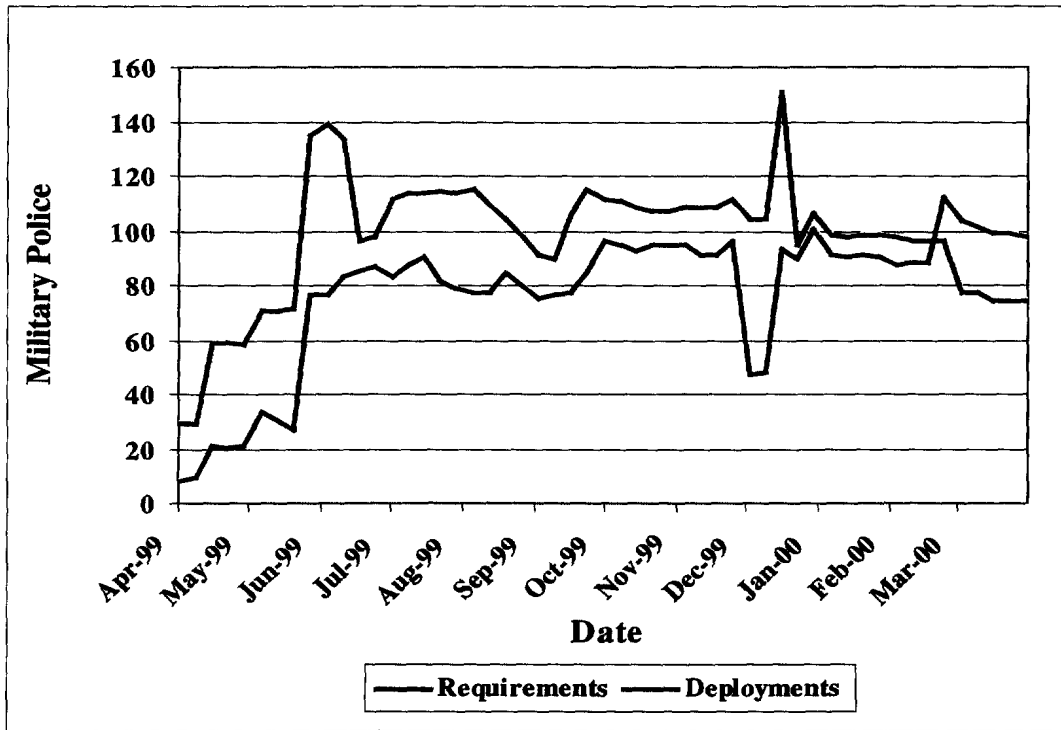


Figure 4: MOC 811 Military Police Demand vs Deployment FY 99/00

Summary

21. The results of the daily demand analysis indicate that it would be difficult to set future manning levels based on historical demands because of the large variability from year to year and within any given year. Historical data is nevertheless useful in identifying meaningful trends. If this approach was to be pursued the CF would likely have to select a manning level to satisfy a percentage of the historical demand and live with the associated risk level of not being able to satisfy all of the demands all of the time.

22. Analysis of the three MOCs revealed that, in general, the demand is not being met which means that the CF is either not filling these positions or is filling them with individuals from other MOCs. This concept of filling a position with a suitable candidate from a different MOC can relieve some of the stress on an over-tasked MOC. However, if individuals from these over-tasked MOCs are similarly employed out of MOC, it exacerbates the problem. To properly analyse this issue the deployed position must be related to the selected candidate. The daily method approach does not lend itself to this type of analysis; therefore the focus of the analysis was redirected to the rotational demand approach.

ROTATIONAL DEMAND ANALYSIS

23. Although the issue presented here was evident in the three MOCs analysed, only the results from the Radio Operators (MOC 211) will be shown to illustrate the point. Table IV shows the historical data for both the requirements and the deployments pertaining to MOC 211. The requirements data represent those positions that called for MOC 211 specifically. It is broken down into positions filled by either a radio operator (With 211) or someone from another MOC (Other). These data are shown graphically in Figure 5. The deployments data represent all radio operators who were deployed. It is broken down into those who were deployed in either a 211 specified position (In MOC), into a generic communication position (Generic) or into a position that did not call for radio operators (Out of MOC). These data are shown graphically in Figure 6.

TABLE IV

MOC 211 Historical Requirements and Deployments - 1991 to 1999

Requirements	YEAR									
	1991	1992	1993	1994	1995	1996	1997	1998	1999	
With 211	190	215	215	261	221	254	212	248	385	
Other	12	26	51	76	62	61	57	34	133	
Deployments										
In MOC	190	215	215	261	221	254	212	248	385	
Generic	64	57	59	13	38	3	18	83	60	
Out of MOC	21	25	42	29	33	17	14	68	54	

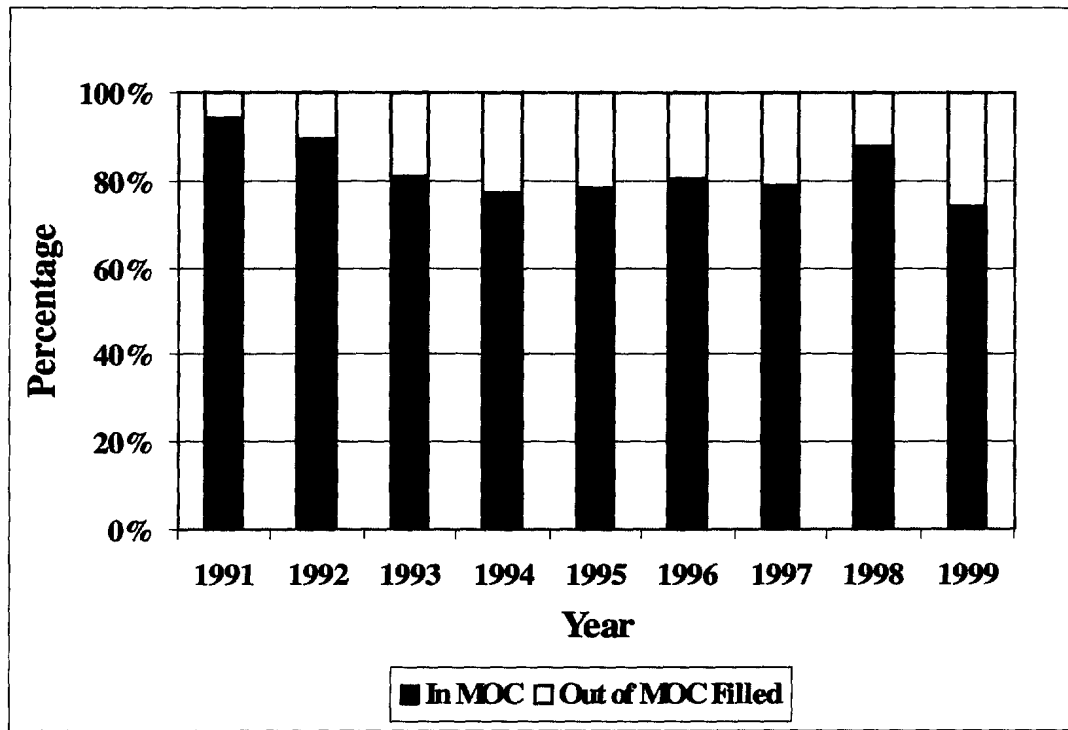


Figure 5: Distribution of MOC 211 Requirements from 1991 to 1999

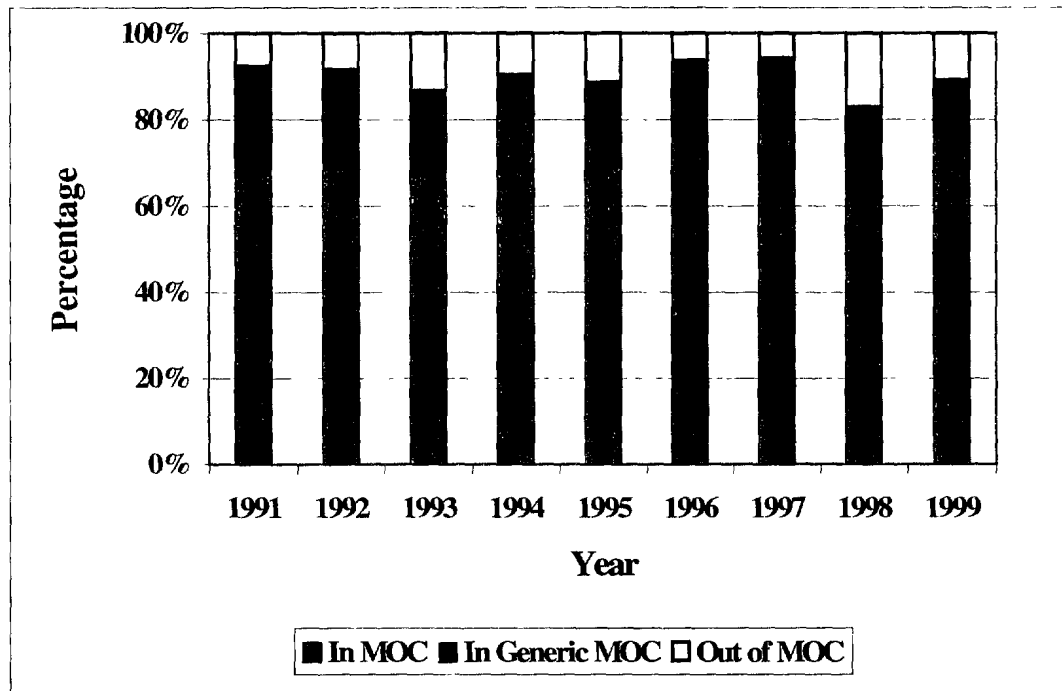


Figure 6: Distribution of MOC 211 Deployments from 1991 to 1999

24. Figure 5 indicates that a sizeable percentage of radio operator positions are being filled by non radio operators while at the same time Figure 6 shows that a sizeable percentage of radio operators are deployed in non-211 specific positions. More detailed analysis is required to properly understand why suitable candidates from non-211 MOCs are filling positions deemed to require a MOC 211 individual. Similarly, further analysis is needed to determine why individuals in over-tasked MOCs such as MOC 211 are not being deployed solely into positions requiring their MOC. This analysis should also include a review of the operational tasking process including the identification of required qualifications for the position and the process of selecting individuals to fill the positions. This process of employment out of MOC may create an apparent shortage in deployable personnel within the MOC in question or inadvertently generate a similar problem with the substituted MOC.

OTHER DEPLOYMENT ISSUES

Changes in Preferred Manning Level (PML)

25. Over the last ten years the regular element of the CF has seen an overall reduction in strength from over 84,000 to just under 60,000 personnel. Over the same period Canada has seen an increase in deployments of its military personnel to support operations. The effects of a steady demand on a declining force or of an increasing demand on a steady force can only increase the difficulty in maintaining a 5:1 ratio. A comparison of PML to demand for each of the three selected MOCs is shown in Figures 7 to 9. These Figures are meant to show the trends in demand and PML and cannot be used to determine whether a 5:1 ratio is being met within a particular MOC.

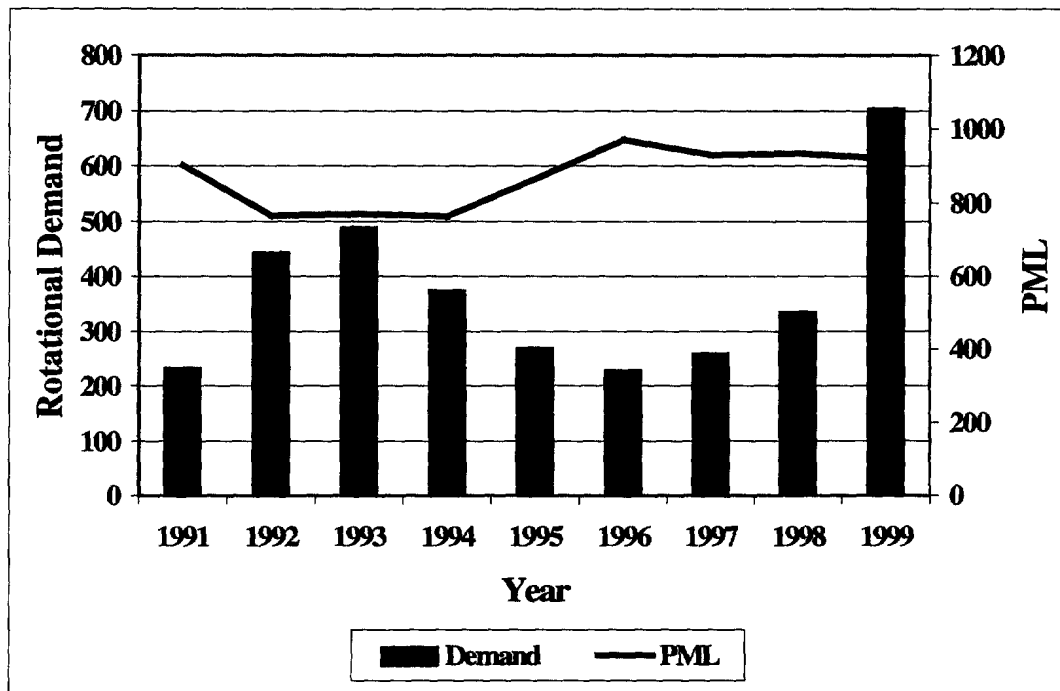


Figure 7: MOC 041 Historical Requirement vs PML from 1991 to 1999

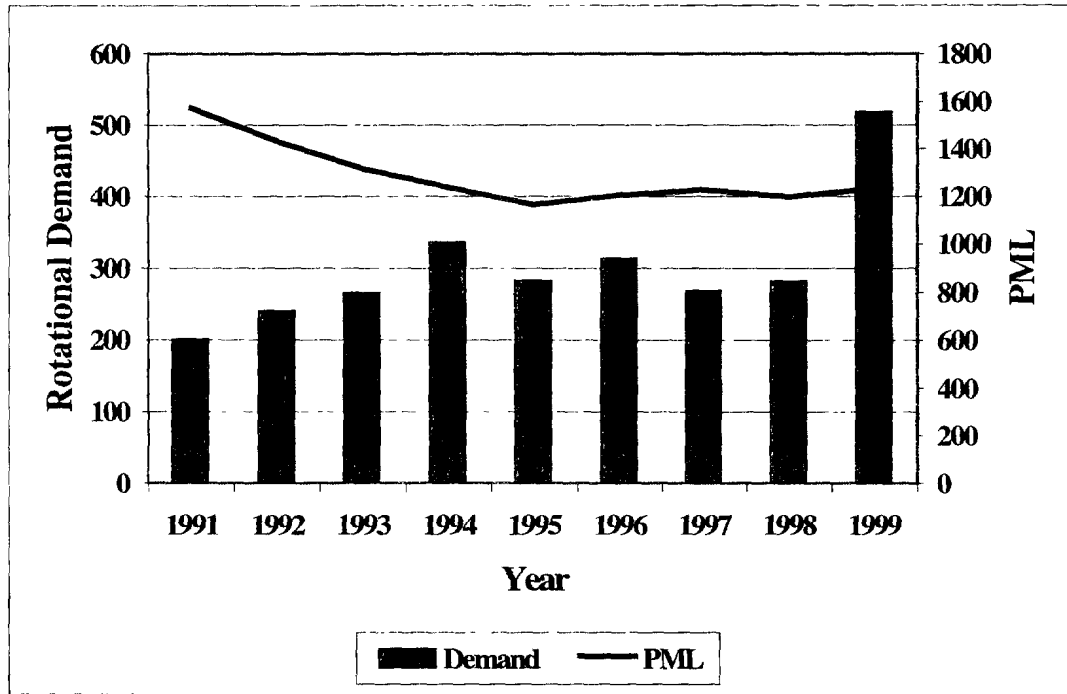


Figure 8: MOC 211 Historical Requirement vs PML from 1991 to 1999

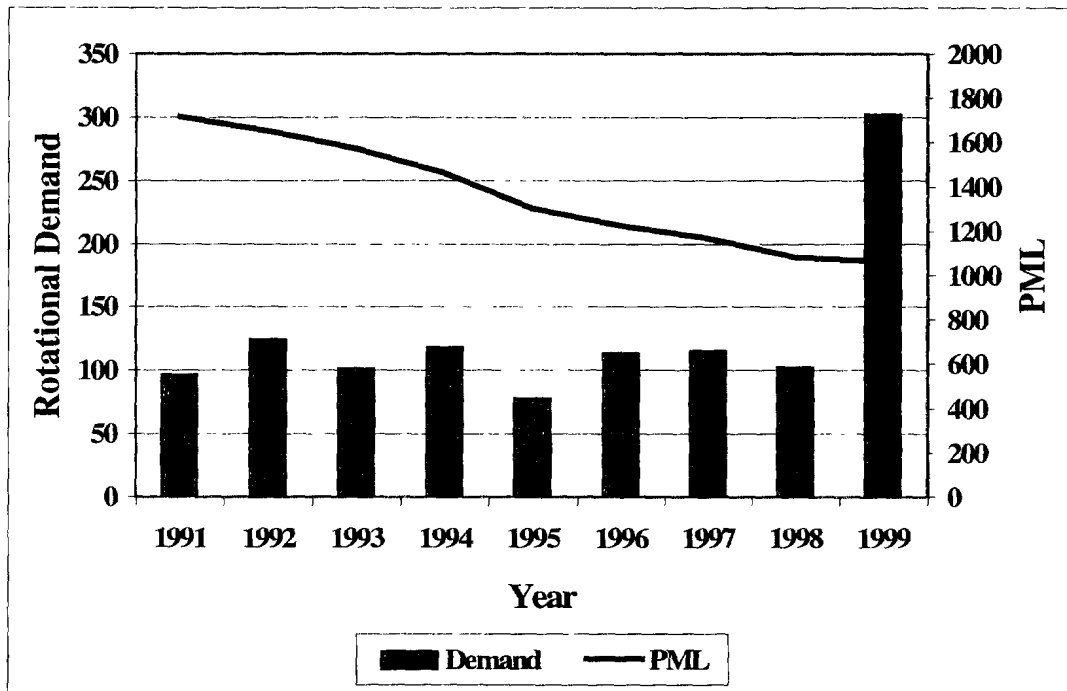


Figure 9: MOC 811 Historical Requirement vs PML from 1991 to 1999

26. In the case of Field Engineers, Figure 7 reveals that since 1996 there has been a steady increase in demand with no corresponding increase in PML. Figure 8 for Radio Operators shows a steady decline in PML from 1991 to 1995 at a time when demand for Radio Operators was increasing. The comparison for MOC 811 at Figure 9 illustrates a declining PML throughout the period of study while the demand remained relatively constant until 1999 when it tripled. There appears to be no correlation between PML and the level of operational activity.

Infrastructure Requirements

27. The traditional approach of restructuring the Army is centered on the design of a Field Force to meet stated Defence objectives. This approach tends to address infrastructure and command requirements much later in the process as opposed to taking a systems approach to restructuring the Army from the outset. The systems approach would need to include historical analysis of previous deployments to indicate what personnel by MOC were needed for various types of operations and the frequency of these operations.

28. In considering support requirements, one must recognize that there are economies of scale. The larger the operation the smaller the proportion of support personnel is required. Similarly the number of infrastructure sites maintained by the CF has a bearing on the overall support requirements. Unlike the Field Force, many of the personnel required to provide Combat Service Support (CSS) are also necessary to support the infrastructure. The number of infrastructure positions that cannot be left vacant, because of a minimum manning level, must be identified. Similarly those individuals considered non-deployable, because of their qualification, knowledge and current employment on high priority tasks, must also be identified. Both of these factors have a direct impact on the development of any planning ratio used in support of foreign deployments.

29. In the course of downsizing the regular element of the CF, the Forces has also undertaken a program whereby certain infrastructure positions or functions are considered for Alternate Service Delivery (ASD). The ASD process converts military positions to civilian ones with a consequence of possibly decreasing the flexibility in sustaining deployed operations.

Planning Ratio

30. The genesis of the 5:1 planning ratio used by the Army for foreign deployments is unknown. It is unclear whether all of the factors that influence this ratio, some of which have been discussed above, have been considered. Another key factor that will have to be considered when determining the ratio are the QOL initiatives currently being pursued by the CF as these will have a direct impact on the deployability of personnel. There is no indication as to where or if the ratio is ever used. It would seem that this planning ratio should be used when redesigning the force structure and as a criteria for deciding CF participation in a proposed operation. Without addressing these questions the planning ratio has no meaning.

Task Authority

31. Task authority is vested in J1 Coord for the CF and the CLS G1 (DLFR) for the Army. However, this authority is at times challenged by Commanders and staff who feel that they should have a veto on the deployability of personnel. This can have a disruptive effect on the management of deployments to support operations and this issue should be explored further.

IV. RECOMMENDATIONS

32. It is recommended that a comprehensive study be undertaken to address the issues identified in this report. This study should encompass all MOCs participating in deployed operations including a rank by rank analysis. The results of this study would allow the restructuring process to adopt more of a systems approach that would consider:

- a. Historical demand;
- b. White paper directed capabilities;
- c. QOL issues; and
- d. Infrastructure needs.

33. As the CFTP captures much of the data required to support and monitor deployments, efforts should be made to improve its robustness and possibly expand its capabilities. Currently, it would appear that CFTP data is not exploited for analysis.

34. A single CF authority should be established and given the responsibility for:
 - a. Verifying the sustainability of a deployed force under the current deployment directives prior to the actual decision to support the mission;
 - b. Identifying command and infrastructure positions that need to be manned at all times and therefore cannot be used for deployment;
 - c. Identifying individuals whose expertise make them essential and hence non-deployable;
 - d. Maintaining the CFTP;
 - e. Analyzing deployment trends and recommending changes in the force structure;
 - f. Reviewing the justification for the stated qualification requirements for deployed positions;
 - g. Approving out-of-MOC assignments; and
 - h. Approving any command override requests.

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5. Canadian Forces Tasking Program (CFTP).

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This research note (RN) outlines the operational research conducted in support of the Chief of Land Staff's study on Army transformation. It reflects ORD work done in direct support of the Land Staff Working Group (LSWG) and the Army Transformation Working Group (ATWG). Environmental Chiefs are faced with changes forced by DND constraints and limitations. The Chief of Land Staff commissioned ORD to assist with options analysis within a project broadly entitled the "CLS Study." The study's objective is to rationalise the Land Force. In essence, the overall study focuses on economies and efficiencies in areas of personnel, finance, and structure. This approach manifested itself as a review of possible army structures, which will allow for the savings and continue to provide what Canada demands of its Army.

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