

# Image Cover Sheet

**CLASSIFICATION**

UNCLASSIFIED

**SYSTEM NUMBER**

509887



**TITLE**

FORECASTING THE AGE DISTRIBUTION OF THE CANADIAN FORCES

**System Number:**

**Patron Number:**

**Requester:**

**Notes:**

**DSIS Use only:**

**Deliver to:**



DEPARTMENT OF NATIONAL DEFENCE  
CANADA



OPERATIONAL RESEARCH DIVISION

DIRECTORATE OF OPERATIONAL RESEARCH  
(CORPORATE, AIR, MARITIME)  
&  
DIRECTORATE OF HUMAN RESOURCE RESEARCH AND EVALUATION

DOR(CAM) RESEARCH NOTE RN 9820

FORECASTING THE AGE DISTRIBUTION OF THE CANADIAN FORCES

By

Dr A. Jesion  
L.F. Kerzner

November 1998

OTTAWA, CANADA



National Defence  
Défense nationale

## Operational Research and Analysis

### CATEGORIES OF PUBLICATION

ORA Reports are the most authoritative and most carefully considered publications issued. They normally embody the results of major research activities or are significant works of lasting value or provide a comprehensive view on major defence research initiatives. ORA Reports are approved by DGOR and are subject to peer review.

ORA Project Reports record the analysis and results of studies conducted for specific sponsors. This category is the main vehicle to report completed research to the sponsors and may also describe a significant milestone in ongoing work. They are approved by DGOR and are subject to peer review. They are released initially to sponsors and may, with sponsor approval, be released to other agencies having an interest in the material.

Directorate Research Notes are issued by directorates. They are intended to outline, develop or document proposals, ideas, analysis or models which do not warrant more formal publication. They may record development work done in support of sponsored projects which could be applied elsewhere in the future. As such they help serve as the corporate scientific memory of the directorate.

DEPARTMENT OF NATIONAL DEFENCE

CANADA

OPERATIONAL RESEARCH DIVISION

&

DIRECTORATE OF HUMAN RESOURCE RESEARCH AND EVALUATION


DOR (CAM) RESEARCH NOTE 9820

FORECASTING THE AGE DISTRIBUTION OF THE CANADIAN FORCES

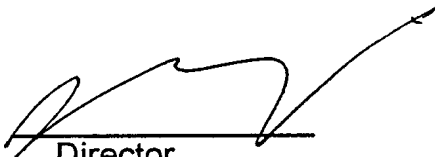
By

Dr A. Jesion  
and  
L.F. Kerzner

Recommended by:

*for*   
Team Leader,  
Personnel Operational  
Research Team

Approved by:

  
Director,  
Operational Research  
(Corporate, Air, Maritime)

The contents are the responsibility of the issuing authority and publication by DOR(CAM) does not necessarily reflect the official position of the Department of National Defence.

OTTAWA, CANADA

November 1998

## ABSTRACT

The office of the Chief of Defence Staff (CDS) requested a forecast of the age distribution of the Canadian Forces (CF), assuming current human resource policies and staff levels remain in effect. In order to accomplish this task within the time available, it was necessary to make a number of simplifying assumptions and these are documented here together with the results obtained from modelling the entire CF officer and non commissioned member (NCM) populations over 10 and 25 year time intervals.

Results indicate that, relative to the 1997 age distribution, an "age gap" will develop in both the officer and NCM populations. In the long run, this gap will largely disappear and the age distributions will flatten out.

## RÉSUMÉ

Le bureau du chef d'état-major de la Défense (CEMD) a demandé qu'on leur fournisse des prévisions sur la distribution selon l'âge des Forces canadiennes (FC) et ce partant de l'hypothèse que les politiques sur les ressources humaines et le niveau de dotation actuels demeurent inchangés. Afin d'accomplir cette tâche dans les délais prévus, nous avons dû simplifier et émettre plusieurs hypothèses, lesquelles sont décrites dans ce rapport. Vous y trouverez également les résultats de la modélisation comprenant toute la population des FC, officiers et MR sur une période de 10 à 25 ans.

Les résultats semblent indiquer qu'à partir de la distribution selon l'âge de 1997, une discontinuité ou brèche dans l'âge apparaîtra tant chez les officiers que chez les MR. Toutefois, à long terme, cette discontinuité disparaîtra presque totalement et la courbe de distribution selon l'âge redeviendra continue, sans brèche.

## TABLE OF CONTENTS

	Page
ABSTRACT/RESUME .....	i
TABLE OF CONTENTS .....	ii
I. INTRODUCTION .....	1
Aim .....	2
Scope .....	2
II. METHODOLOGY .....	3
The GeM Model Building Utility .....	3
Modelling Assumptions .....	4
Intake Assumptions .....	4
Attrition Assumptions .....	7
Preferred Manning Level (PML) Assumptions .....	12
Minimum Time in Rank Assumptions .....	13
Promotion Assumptions .....	13
Engagement Assumptions .....	16
"Other" Assumptions .....	16
III. MODELLING RESULTS .....	17
CF Officer Age Distribution .....	17
CF NCM Age Distribution .....	19
IV. SUMMARY AND CONCLUDING REMARKS .....	21
LIST OF REFERENCES .....	22

# FORECASTING THE AGE DISTRIBUTION OF THE CANADIAN FORCES

## I. INTRODUCTION

1. Concerns about the demographic profile of the Canadian Forces (CF) continue as a result of reengineering and restructuring, as well as the application of other human resource (HR) policies. Recently, in conjunction with "Quality of Life" concerns, the office of the Chief of Defence Staff (CDS) requested a forecast of the age distribution of CF members from the Assistant Deputy Minister (Human Resources - Military) [ADM (HR-Mil)]. This request was passed through the chain of command to the Defence Scientists of the Personnel Operational Research Team (PORT) who provide the department with such forecasts using a software package known as the Generic Modelling utility (GeM). These Defence Scientists are assigned to ADM (HR-Mil) by the Operational Research Division to support personnel policy development.
2. Operational research and analysis in support of military HR policy development is an ongoing activity in the PORT where a number of studies have been recently published reporting forecasts of relevant measures of concern to military HR managers. For example, Reference 1 is an investigation of the implications of the university degree policy for officers, Reference 2 documents a strategic analysis of the proposed restructuring of the Dental Clinic Assistant military occupation, and Reference 3 contains long range forecasts of experience levels in engineering officer occupations.
3. Many military occupations (MOCs) have suffered reductions recently and recruitment (intake) has been slowed to a trickle in many cases. For certain occupations, promotions have been fewer and farther apart. At the same time, there are concerns about higher than normal attrition in some occupations. The age distribution of the CF is one obvious indicator of the health and vitality of the CF. How will this age distribution look in the next 10 to 25 years? This paper documents the background analysis and methodology used to provide the CDS with such forecasts.



4. Current demographic characteristics of the CF should be available from the Human Resources Information System (HRIS), but forecasts of how these distributions will look in the future are only obtained from modelling the CF as a whole. This paper contains not only a snapshot of the current age distribution of the officer and non-commissioned member (NCM) populations but also forecasts these distributions 10 and 25 years into the future, i.e. the calendar years 2007 and 2022. (The baseline year was selected as 1997 to reflect the availability of reliable data.) The 25 year forecast approximates the "steady-state" situation where no changes are made to current military HR policies, such as the size of the CF, terms of service, etc. It should be pointed out that this never happens in practice as HR policies are usually modified before such a "steady-state" is attained.

#### **Aim**

5. The aim of this paper is to document the methodology employed to provide forecasts of the age distribution of the CF to the CDS for the years 2007 and 2022. The results provided to the CDS are included in this paper.

#### **Scope**

6. This paper makes use of the April 1997 CF database for "trained effective strength", obtained from the former Directorate of Personnel Information Systems (DPIS), the PORT strategic desktop computer database (Reference 4), and other departmental planning documents such as Projected Status Reports (Reference 5). Although care was taken to ensure data accuracy and to check modelling assumptions, the results reported here were developed under strict time deadlines and hence must be regarded as preliminary in nature. A considerable number of simplifications were needed in order to develop the age distribution forecasts and these should be re-visited if higher fidelity is needed. However the authors believe the observed trends to be indicative of the CF age distribution in the future.

7. This analysis applies to only the regular force component of the CF.

## II. METHODOLOGY

### The GeM Model Building Utility

8. The age distribution forecasts provided by PORT are produced via employment of the GeM utility - a powerful model building environment which was originally developed by the Directorate of Manpower Analysis (D Man A) in the early 1990's. GeM models 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 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 Military Occupational Reviews, and has provided short term guidance in the setting of intake and CFCDP gate levels to meet occupational objectives. More recently, GeM models have been applied to support more strategic policy development (e.g. References 1 to 3).

10. Most GeM modelling results are provided to clients in the form of tables and/or charts. Upwards of 80 charts are available in each instance and such a volume of information greatly exceeds what most clients require. In this particular analysis, the requirement for "global" CF age distribution charts greatly reduced the volume of results reported.

11. The charts provided for the CF officer and NCM populations are snapshots of the predicted age distributions, at model year 10 (in effect, the year 2007) and model year 25 (the year 2022). Desirable characteristics in these charts are "smooth curves" representing a good mix of youth and experience from which suitable candidates for various jobs may be drawn. The peak of a desirable CF age distribution should likely be skewed to the lower end of the age continuum, to reflect military requirements for physical fitness, etc. - but each individual occupation may have different requirements

### **Modelling Assumptions**

12. For this study, previously developed GeM models for officers and NCMs were combined and updated with the most reliable demographic information available. These input data were primarily related to updates of Preferred Manning Level (PML) targets and the addition of recent attrition data. Generic assumptions concerning promotion zones and contract conversions were used so as to avoid specifics associated with any particular MOC. Thus "global" officer and NCM GeM models are synthetic constructs and do not replicate/simulate MOC-specific HR policies.

### **Intake Assumptions**

13. The baseline year was selected as 1997 to make use of available personnel data required to initialize each "global" model. Officer and NCM intake for each model was assumed to be as shown in Table I below.

**Table I**  
**GeM "GLOBAL" MODELS: INTAKE ASSUMPTIONS**

<b>GLOBAL MODEL</b>	<b>Year 1 Intake (1997)</b>	<b>Year 2 Intake (Current)</b>	<b>Year 3 + Intake Min/Max</b>
Officer	408	438	300/650
NCM	2016	982	0/3500

14. GeM models assume that recruits have an age distribution consistent with historical recruitment patterns. The intake age distribution for the NCM global model is given in Table II below. Officer intake is more diverse. Historical officer intake patterns have been modified to remove OCTP<sup>1</sup> intake and scale up other entry plan intake as follows:

- a. ROTP 51%;
- b. UTPNCM 10%;
- c. DEO 28%; and
- d. CFR 11%.

Each of these "flows" has a different age/Years of Service (YOS) pattern for officer intake as shown in Tables IIIa and IIIb on the next page.

**TABLE II**  
**"GLOBAL" NCM MODEL: RECRUIT AGE DISTRIBUTION**  
**(All Model Years)**

Age	Probability	Age	Probability
17	5%	23	6%
18	17%	24	4%
19	21%	25	3%
20	18%	26	1%
21	14%	27	1%
22	9%	28	1%

---

<sup>1</sup> Definitions: OCTP - Officer Cadet Training Plan;  
ROTP - Regular Officer Training Plan;  
UTPNCM - University Training Plan for NCMs;  
DEO - Direct Entry Officers; and  
CFR - Commission From the Ranks.

**TABLE IIIa**  
**"GLOBAL" OFFICER MODEL: ROTP INTAKE AGE DISTRIBUTION**  
**(All Model Years)**

Age	Probability YOS = 1	Probability YOS = 2	Probability YOS = 3	Probability YOS = 4	Probability YOS = 5
20	3%	2%	3%	0%	0%
21	12%	13%	14%	9%	5%
22	38%	34%	34%	43%	56%
23	34%	32%	33%	38%	32%
24	11%	12%	10%	8%	6%
25	2%	7%	6%	2%	1%

**TABLE IIIb**  
**"GLOBAL" OFFICER MODEL: NON-ROTP INTAKE AGE DISTRIBUTION**  
**(All Model Years)**

Age	Probability OCTP (See Note 1)	Probability DEO (See Note 2)	Probability CFR (See Note 3)	Probability UTPNM (See Note 4)
18	1%			
19	8%			
20	19%	1%		
21	21%	4%		
22	18%	8%		
23	12%	14%		1%
24	9%	19%		1%
25	6%	17%		1%
26	3%	12%		6%
27	2%	8%		9%
28	1%	5%		12%
29		3%		14%
30		2%		11%
31		2%		12%
32		1%		11%
33		1%		8%
34		1%		8%
35		1%		4%
36		1%		1%
37				1%
38		continued on the	next page	

39			17%	
40			18%	
41			16%	
42			14%	
43			11%	
44			9%	
45			6%	
46			7%	
47			1%	
48			1%	

Note 1: OCTP intake is set to zero in this model. As such, the historical pattern for OCTP intake age distribution is included for comparative purposes only.

Note 2: DEO entrants are assigned 0 or 1 YOS with equal probability.

Note 3: The age distribution shown is assumed to apply equally to entrants at the captain or lieutenant rank. (The captains are assumed to have an IPS engagement while the lieutenants are assumed to have an IE engagement.) The YOS assigned to CFR entrants is as follows:

- a. probability 10% that YOS = age - 23;
- b. probability 20% that YOS = age - 22;
- c. probability 40% that YOS = age - 21;
- d. probability 20% that YOS = age - 20; and
- e. probability 10 % that YOS = age - 19.

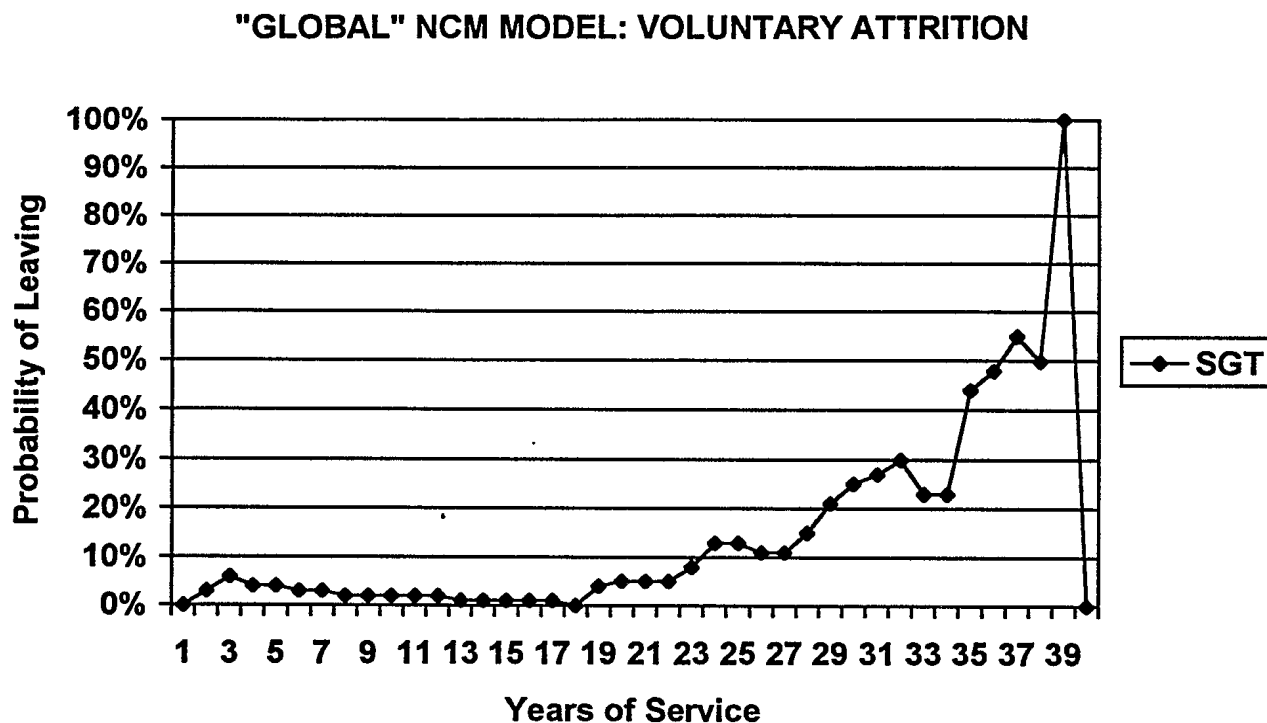
Note 4: For UTPNCM, YOS of entrants is assigned as follows:

- a. probability 25% that YOS = age - 20;
- b. probability 50% that YOS = age - 19; and
- c. probability 25% that YOS = age - 18.

### **Attrition Assumptions**

15. GeM models assume historical voluntary post-qualification attrition rates which are a function of Years of Commissioned Service (YCS), entry plan, age, and rank for officer models and age and rank for NCMs. These attrition rates are based on historical data for all releases over the past 15 years. Years where the Forces Reduction Plan (FRP) affected attrition patterns have been excluded from the historical data for attrition.

16. NCM voluntary attrition assumptions are given in Table IV on the next page. The table displays the probability that an NCM at any particular year of service and rank leaves the CF during that year (only). That is, the data are not cumulative. The probabilities were derived from actual attrition statistics and can be distorted because of low populations (e.g. at very high YOS values, the total population can be as low as one individual.) More information concerning how these attrition assumptions were developed is available from the authors. As an illustration, Figure 1 below displays the attrition pattern for the SGT rank only.



**Figure 1**  
Sample Chart of Voluntary Attrition Rates  
(all NCMs at the SGT/CPO2 Rank as a function of YOS)

**TABLE IV**

**"GLOBAL" NCM MODEL: VOLUNTARY ATTRITION PROFILE**

Each cell contains the probability of leaving in a particular YOS.

YOS	PTE	CPL	MCPL	SGT	WO	MWO	CWO
1	8%	1%	3%				
2	12%	4%	5%	3%			
3	7%	8%	3%	6%			
4	10%	4%	4%	4%			
5	13%	5%	3%	4%			
6	14%	5%	3%	3%	9%		
7	18%	4%	3%	3%	5%		
8	18%	4%	3%	2%	3%		
9	33%	3%	2%	2%	1%		
10	25%	3%	3%	2%			
11	22%	3%	3%	2%	1%	14%	
12	19%	3%	2%	2%	1%		
13	7%	3%	2%	1%	1%		
14	16%	2%	1%	1%	1%		
15	33%	2%	1%	1%	1%	1%	
16	80%	2%	1%	1%	1%		
17	33%	1%	1%	1%			
18	25%	1%	1%				
19	75%	6%	6%	4%	3%	2%	4%
20	67%	8%	8%	5%	3%	3%	1%
21	75%	10%	8%	5%	3%	3%	4%
22	100%	8%	8%	5%	4%	3%	2%
23		13%	11%	8%	7%	5%	7%
24		22%	20%	13%	10%	8%	7%
25		18%	14%	13%	11%	9%	7%
26		14%	13%	11%	8%	6%	7%
27		20%	16%	11%	11%	8%	7%
28	100%	16%	17%	15%	11%	10%	7%
29		23%	22%	21%	15%	12%	11%
30		38%	29%	25%	19%	12%	10%
31		33%	38%	27%	21%	13%	10%
32		45%	40%	30%	25%	16%	13%
33		50%	45%	23%	22%	22%	14%
34		25%	35%	23%	25%	33%	20%
35		38%	30%	44%	36%	39%	35%
36		60%	44%	48%	42%	48%	50%
37			100%	55%	48%	38%	55%
38		100%		50%	100%	56%	29%
39				100%			25%



17. For officers, attrition during the first nine years of commissioned service is more closely related to entry plan than age. The "global" GeM officer model takes the attrition pattern as shown in Table V below to be dominant in the first nine years of service. After this, attrition according to age is assumed as given in Table VI on the next page. More information concerning how these attrition assumptions were developed is available from the authors.

**TABLE V**  
**"GLOBAL" OFFICER MODEL: VOLUNTARY ATTRITION PROFILE**  
**(by entry plan in the first nine Years of Commissioned Service - YCS)**

Each cell contains the probability of leaving in that particular YCS.

YCS (yrs)	Probability ROTP	Probability OCTP (See Note 1)	Probability DEO	Probability CFR	Probability UTPNM
1					
2		2%	1%	1%	
3	1%	3%	6%	2%	
4	9%	3%	5%	4%	2%
5	10%	3%	3%	3%	8%
6	4%	2%	5%	2%	4%
7	3%		1%	4%	2%
8	3%	11%	5%	6%	3%
9	5%	22%	12%	8%	6%

Note 1: Although OCTP intake was set to zero in this model, personnel remain in the "system" having OCTP as their entry plan.

**TABLE VI**  
**"GLOBAL" OFFICER MODEL: VOLUNTARY ATTRITION PROBABILITY**  
**(by rank and age)**

Each cell contains the probability of leaving at a particular age.

Ranks include naval equivalents.

There are no general officers in this model.

AGE	LT	CAPT	MAJ	LCOL	COL
28					
29					
30					
31			1%		
32			2%		
33	1%	1%	2%		
34	1%	1%			
35	2%	2%	1%	1%	
36	2%	2%	1%		
37	1%	1%	1%	1%	
38	4%	4%	3%	1%	
39	3%	3%	3%	2%	
40	7%	7%	4%	7%	3%
41	8%	8%	5%	7%	2%
42	5%	5%	5%	6%	6%
43	5%	5%	3%	7%	4%
44	6%	6%	5%	4%	1%
45	9%	9%	7%	5%	
46	8%	8%	11%	5%	4%
47	4%	4%	10%	5%	3%
48	13%	13%	9%	8%	3%
49	11%	11%	10%	10%	6%
50	14%	14%	10%	5%	6%
51	12%	12%	15%	10%	8%
52	12%	12%	9%	13%	5%
53	12%	12%	13%	17%	14%
54	17%	17%	24%	13%	5%
55	20%	20%	27%	27%	26%

**Preferred Manning Level (PML) Assumptions**

18. PML targets used in the "global" CF officer and NCM models are contained in Table VIIa for officers and VIIb for NCMs. Model year 0 refers to 1997 while model year 1 is the current year. PML assumptions (from Reference 5) were assumed to be applicable to all subsequent GeM model years. That is, the PML targets reflect the assumption that CF population levels remain constant.

**TABLE VIIa**  
**"GLOBAL" OFFICER MODEL: PML TARGETS**

Ranks include naval equivalents.

There are no general officers in this model.

Rank	PML (1997: Year 1)	PML (1998: Year 2)	PML (Year 3+)
COL	245	261	233
LCOL	882	955	924
MAJ	2962	2926	3015
CAPT/LT	6706	6787	6891
Total	10795	10929	11063

**TABLE VIIb**  
**"GLOBAL" NCM MODEL: PML TARGETS**  
**(All Model Years)**

Ranks include naval equivalents.

Rank	PML (1997: Year 1)	PML (1998: Year 2)	PML (Year 3+)
CWO	622	523	640
MWO	1768	1663	1857
WO	3925	3618	4032
SGT	7345	6699	7530
MCPL	9367	8842	9453
PTE/CPL	24658	24658	24908
Total	47712	46003	48420

### Minimum Time in Rank Assumptions

19. Minimum time in rank for promotion to the rank indicated was assumed to be as shown in Table VIII below for all officers and NCMs.

**TABLE VIII**  
**ASSUMED MINIMUM TIME IN RANK FOR PROMOTION**  
**(Into the rank shown)**

Ranks include naval equivalents.

There are no general officers in the officer model.

OFFICER MODEL		NCM MODEL	
Rank	Years	Rank	Years
COL	2	CWO	2
LCOL	3	MWO	3
MAJOR	3	WO	3
CAPT/LT	2	SGT	2
		MCPL	2
		CPL	4

### Promotion Assumptions

20. Promotion probabilities in GeM models are based on historical promotion rates. For "global" models, these rates were derived from the PORT database directly, using appropriate Microsoft Access "queries". (Reference 4) These promotion rates are based on historical data for all promotions over the past 15 years. Since the "global" officer model contains no general officers, the promotion rate of colonels was set to zero. (This missing "flow" represents a small distortion in the overall officer population results - a problem which should be rectified in a future model.)

21. Officer promotion probabilities are given in Table IX below as a function of rank and time in rank (TIR). The table displays the probability that an officer at any particular time in rank (above the minimum TIR) gets promoted into the rank shown in a given year. The data are not cumulative. The probabilities were derived from actual promotion statistics and can be distorted when populations are low. However, at TIR greater than 14, no officer promotions at all were contained in the database. NCM promotion probabilities are given in Table X on the next page as a function of rank and YOS.

**TABLE IX**  
**"GLOBAL" OFFICER MODEL: PROMOTION PROBABILITIES**  
**(by rank and TIR)**

Each cell contains the single year probability of promotion for a particular TIR.  
Ranks include naval equivalents.

<b>TIR (years)</b>	<b>TO MAJ</b>	<b>TO LCOL</b>	<b>TO COL</b>
3	2%	3%	6%
4	7%	14%	21%
5	18%	23%	16%
6	18%	25%	21%
7	12%	12%	13%
8	10%	6%	10%
9	12%	5%	2%
10	8%	6%	2%
11	5%	3%	5%
12	3%	1%	1%
13	2%	1%	1%
14	3%	1%	1%

**TABLE X**  
**"GLOBAL" NCM MODEL: PROMOTION PROBABILITIES**  
**(by rank and YOS)**

Each cell contains the single year probability of promotion for a particular YOS.

Ranks include naval equivalents.

<b>YOS (years)</b>	<b>TO MCPL</b>	<b>TO SGT</b>	<b>TO WO</b>	<b>TO MWO</b>	<b>TO CWO</b>
4	1%				
5	2%	1%			
6	2%	1%			
7	6%	1%			
8	9%	2%			
9	13%	4%			
10	14%	6%	1%		
11	13%	8%	1%		
12	11%	10%	3%		
13	9%	10%	4%		
14	6%	12%	6%	1%	
15	5%	10%	8%	2%	
16	3%	9%	10%	3%	
17	2%	7%	12%	5%	
18	1%	6%	11%	6%	1%
19	1%	4%	10%	8%	2%
20		3%	8%	11%	5%
21		2%	7%	9%	6%
22		1%	5%	10%	7%
23		1%	4%	10%	7%
24		1%	3%	8%	10%
25			2%	6%	11%
26			2%	5%	9%
27			1%	5%	7%
28			1%	4%	9%
29			1%	3%	7%
30				1%	7%
31				1%	4%
32				1%	2%
33					1%
34					1%

### **Engagement/Gate Assumptions**

22. GeM models must keep track of engagement plans, contract expiry dates, and conversion rates in order to simulate the flow of members through the HR system. For the "global" officer model, conversion rates from short engagement (SE) to intermediate engagement (IE) and from IE to indefinite period of service (IPS) are assumed to be 100% for all commissioned ranks.

23. For the "global" NCM model, conversion from basic engagement (BE) to IE is assumed to be 90% up to and including the rank of SGT. Conversion from IE to continuing engagement (CE) is taken to be 100% for CPL. Conversion from IE to IPS is set at 100% for WO. At SGT, conversion from IE to IPS is 70% while conversion to CE is 30%. At MCPL, conversion rates from IE to IPS or CE are set to 50% each. At CPL, conversion from IE to CE is 100%.

### **"Other" Assumptions**

24. The above input data do not constitute the complete set of assumptions required to run the "global" GeM models. If the reader requires more information concerning other input assumptions, the authors should be contacted directly to obtain further details of the modelling assumptions. These assumptions were developed from the data contained in the PORT strategic personnel database (Reference 4).

### III. MODELLING RESULTS

#### CF Officer Age Distribution

25. Figure 2 presents the 1997 CF officer age distribution (for all ranks) as contained in the PORT strategic database. Figure 3 is a forecast of the CF officer age distribution for model year 10 - representing the calendar year 2007. The chart shows a distinct "double hump" structure, indicating that recruitment/attrition patterns will cause a reduction in the relative numbers of officers in their mid-thirties from the current situation. Figure 4 is a forecast of the CF officer age distribution for model year 25 - representing the calendar year 2022. This is a "prediction" of the officer age distribution if current HR policies and staff levels remain fixed for 25 years. The numbers of officers in their mid-thirties increases in Figure 4, but the age distribution does not return to its current shape, i.e. a distinct flattening in the age profile is predicted.

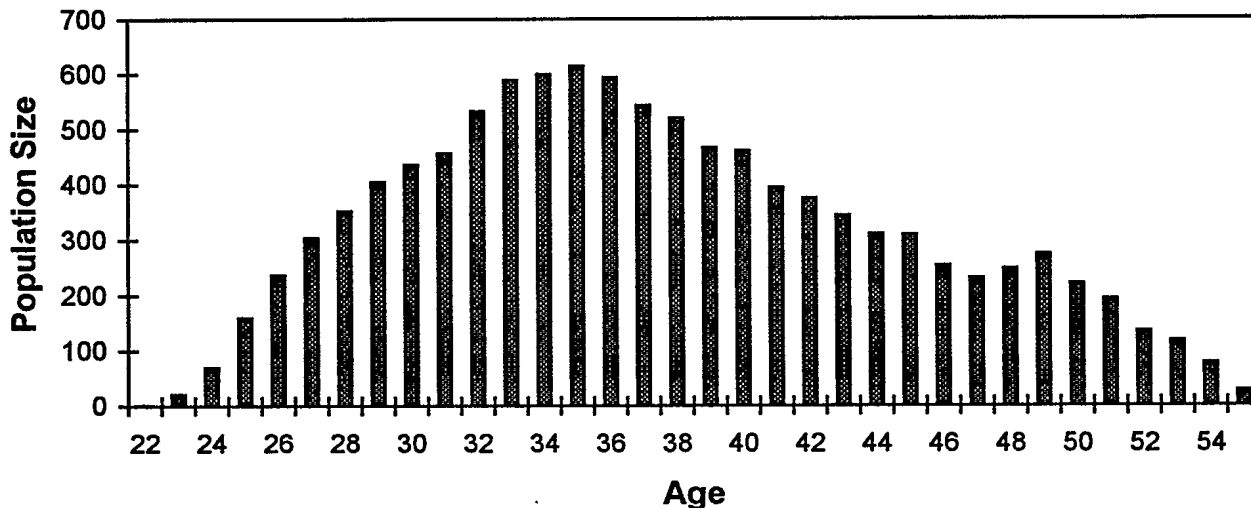


Figure 2: The CF Officer Age Distribution as of 1 April 1997



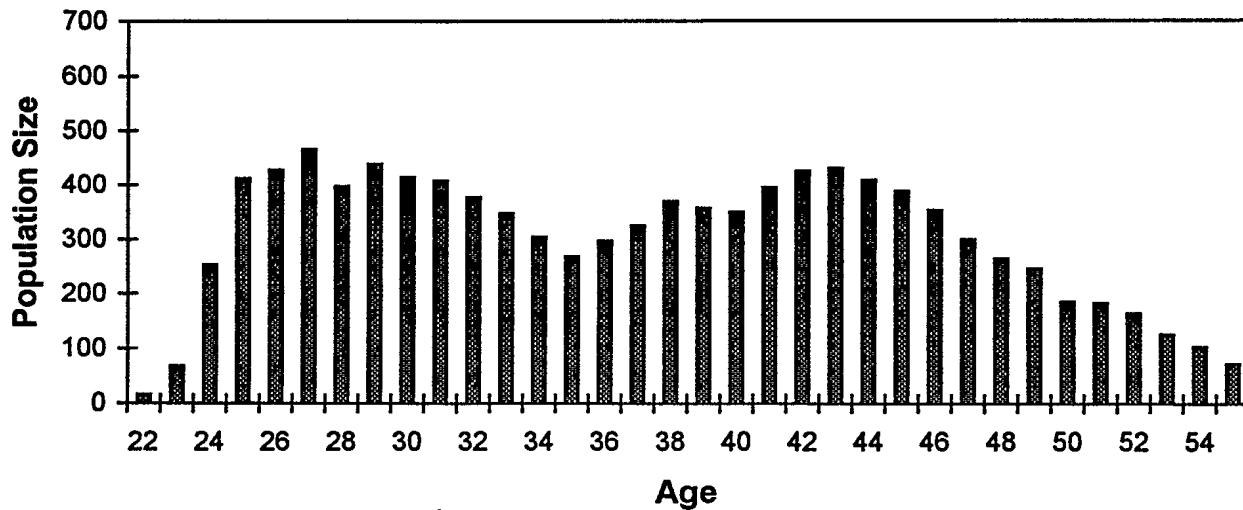


Figure 3: Forecast CF Officer Age Distribution for 2007

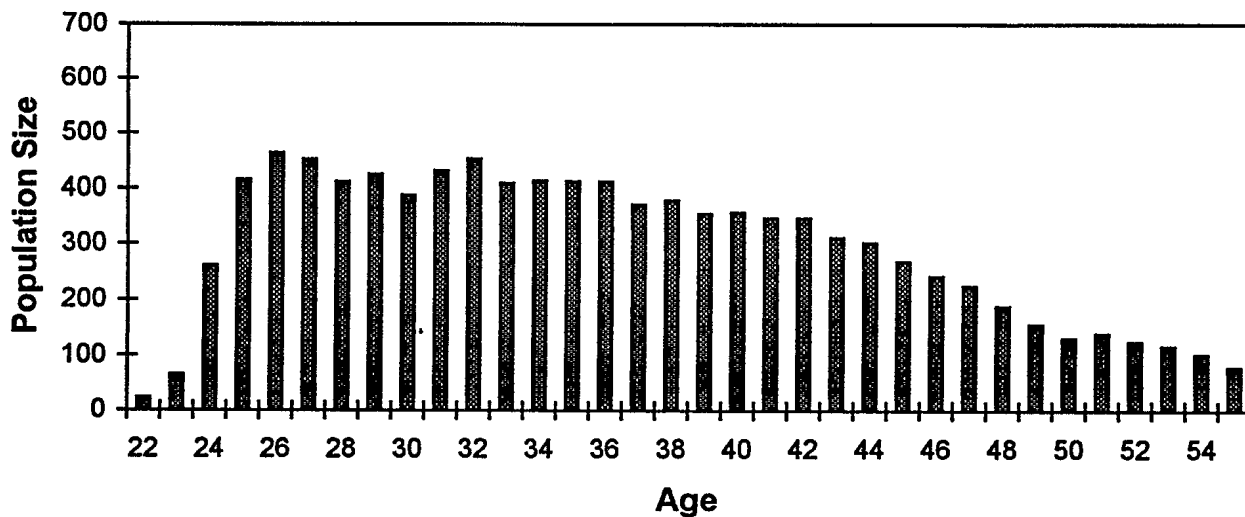


Figure 4: Forecast CF Officer Age Distribution for 2022

### CF NCM Age Distribution

26. Figure 5 presents the 1997 CF NCM age distribution (for all ranks) as contained in the PORT strategic database. Figure 6 is a forecast of the CF NCM age distribution for model year 10 - representing the calendar year 2007. As for the officer case, the chart also shows a "double hump" structure, indicating that recruitment/attrition patterns will cause a reduction in the relative numbers of NCMs in their late twenties and early thirties from the current situation. Figure 7 is a forecast of the CF NCM age distribution for model year 25 - representing the calendar year 2022. This is a "prediction" of the NCM age distribution if current HR policies and staff levels remain fixed for 25 years. The valley of the distribution (around the age of 30) disappears in the long run, but the peak in the age distribution will shift to a lower age bracket.

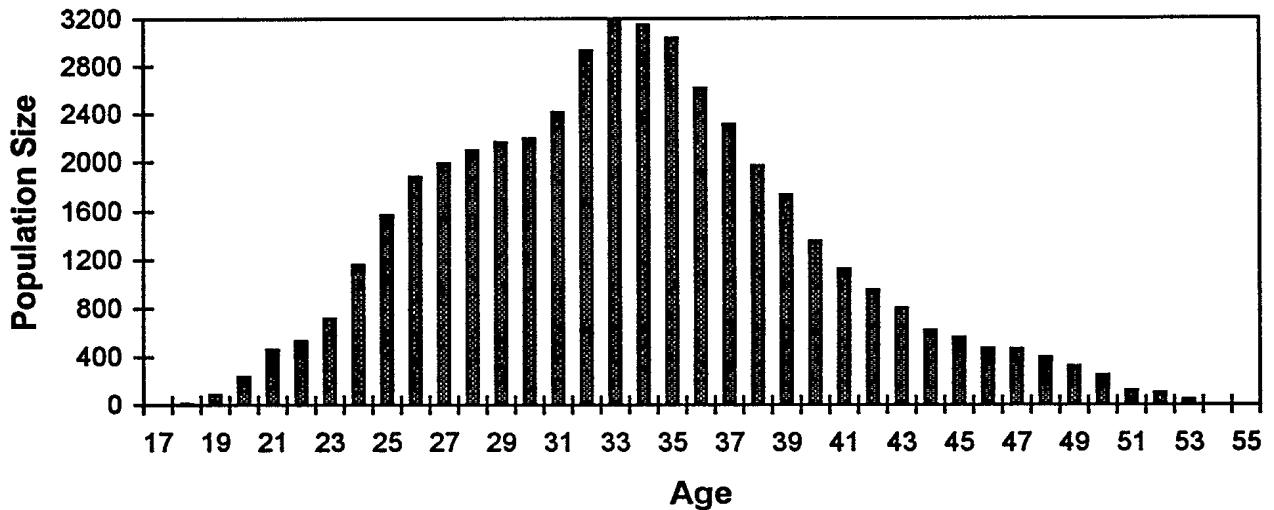


Figure 5: The CF NCM Age Distribution as of 1 April 1997

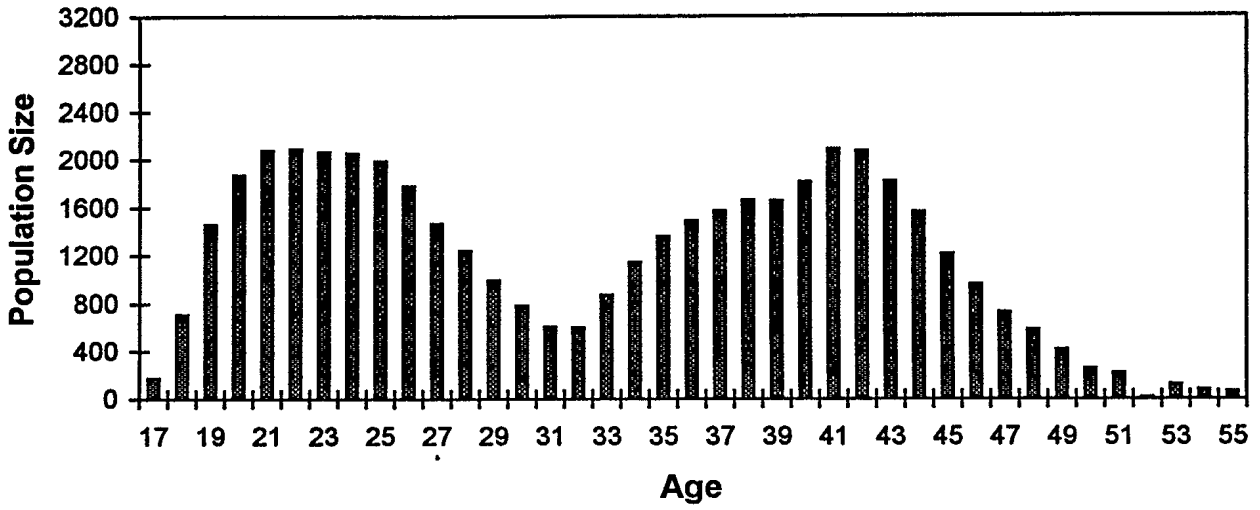


Figure 6: Forecast CF NCM Age Distribution for 2007

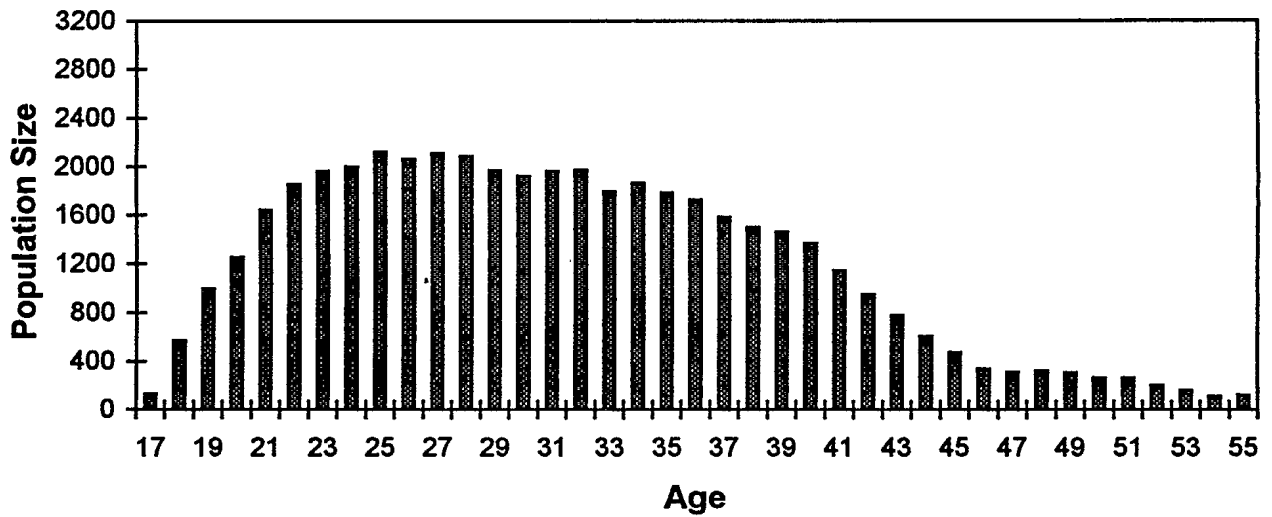


Figure 7: Forecast CF NCM Age Distribution for 2022

#### IV. SUMMARY AND CONCLUDING REMARKS

27. The office of the CDS requested a forecast of the age distribution of the CF, assuming current HR policies and staff levels remain in effect. In order to accomplish this task within the time available, it was necessary to make a number of simplifying assumptions and these are documented here together with the results obtained from modelling the entire CF officer and NCM populations over 10 and 25 year time intervals.

28. Results indicate that, relative to the 1997 age distribution, an "age gap" will develop in both the officer and NCM populations. In the long run, this gap will largely disappear and the age distributions will flatten out.

29. The accuracy of HR model forecasts is dependent on the validity of the assumptions that go into these models. However, the predicted age distributions reported here are considered to be relatively robust because demographic patterns evolve slowly in response to changes in HR policies. For example, NCM recruitment reductions at year X invariably result in a dip in their age distribution at an age of approximately  $X+20$ , taking 20 as the "expected" NCM recruitment age. The "damage" to this age distribution has been done and it is difficult to counter this problem with subsequent remedial action. (One such action would be adoption of HR policies which reduce attrition for population cohorts in age brackets where shortages are predicted.)

30. Although the focus of this paper is the global age distribution of the CF, other measures can be useful for assessment of the health of the CF and these have been used as effective HR management tools in the past (e.g. time in rank and years of service distributions). Also, more research is required to develop higher fidelity global models in order to investigate the implications of proposed HR policies, such as downsizing options, before they are implemented. Furthermore, to address complex multi-MOC HR issues, there is a requirement to develop other types of global models such as single environment HR models, combined combat arms/combat support HR models, etc. Further work in this particular area is contingent upon sponsor interest and availability of resources in the PORT work program.

## LIST OF REFERENCES

- [1] Director Operational Research (Corporate, Air, and Maritime) Research Note 9806, **Models of Canadian Forces Officer Occupations Most Affected by University Degree Requirements**, by Dr A. Jesion and L.F.Kerzner, dated May 1998 (UNCLASSIFIED).
- [2] Director Operational Research (Corporate, Air, and Maritime) Research Note 9811, **Strategic Personnel Modelling for the Dental Clinic Assistant Military Occupation (MOC 722)**, by L.F.Kerzner and Dr A. Jesion, dated July 1998 (UNCLASSIFIED).
- [3] Director Operational Research (Corporate, Air, and Maritime) Research Note 9813, **Canadian Forces Engineering Officer Occupations in 2006: Problems on the Horizon?**, by Dr A. Jesion and L.F.Kerzner, dated September 1998 (UNCLASSIFIED).
- [4] Director Operational Research (Corporate, Air, and Maritime) Research Note 9801, **A Strategic Military Personnel Database for Desktop Computers**, by L.F.Kerzner, Dr A. Jesion, and Dr G.H. Chan, dated February 1998 (UNCLASSIFIED).
- [5] Directorate of Personnel Plans, Projected Status Report for FY 98/99, effective 01 Oct 97.

**UNCLASSIFIED**  
**SECURITY CLASSIFICATION OF FORM**  
(highest classification of Title, Abstract, Keywords)

<b>DOCUMENT CONTROL DATA</b> (Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)		
1. ORIGINATOR (the name and address of the organization preparing the document. Organizations for whom the document was prepared e.g. Establishment Sponsoring a contractor's report, or tasking agency, are entered in Section 8).  <b>PERSONNEL OPERATIONAL RESEARCH TEAM, ADM HR-Mil, NATIONAL DEFENCE HQ, OTTAWA, CANADA, K1A 0K2</b>		2. SECURITY CLASSIFICATION (overall security classification of the document, including special warning terms if applicable)  <b>Unclassified</b>
3. TITLE (the complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title)  <b>Forecasting the Age Distribution of the Canadian Forces (U)</b>		
4. AUTHORS (last name, first name, middle initial)  <b>Jesion, Dr A. and Kerzner, L.F.</b>		
5. DATE OF PUBLICATION (month Year of Publication of document)  <b>November 1998</b>	6a. NO OF PAGES (total containing information. Include Annexes, Appendices, etc.) <b>22</b>	6b. NO OF REFS (total cited in document)  <b>5</b>
7. DESCRIPTIVE NOTES (the category of document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)  <b>Research Note</b>		
8. SPONSORING ACTIVITY (the name of the department project office or laboratory sponsoring the research and development. Include the address).  <b>Director General Military Human Resources Policy and Planning</b>		
9a. PROJECT OR GRANT NO. (if appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)  <b>NIL</b>	9b. CONTRACT NO. (if appropriate, the applicable number under which the document was written.)  <b>NIL</b>	
10a. ORIGINATOR's document number (the official document number by which the document is identified by the originating activity. This number must be unique to this document.)  <b>DOR(CAM) RN-9820</b>	10b. OTHER DOCUMENT NOS. (Any other numbers which may be assigned this document either by the originator or by the sponsor.)	
11. DOCUMENT AVAILABILITY (any limitations on further dissemination of the document, other than those imposed by security classification.) <input checked="" type="checkbox"/> Unlimited distribution <input type="checkbox"/> Distribution limited to defence departments and defence contractors: further distribution only as approved <input type="checkbox"/> Distribution limited to defence departments and Canadian defence contractors; further distribution only as approved <input type="checkbox"/> Distribution limited to government departments and agencies; further distribution only as approved <input type="checkbox"/> Distribution limited to defence departments; further distribution only as approved <input type="checkbox"/> Other (please specify):		
12. DOCUMENT ANNOUNCEMENT (any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11). However, where further distribution (beyond the audience specified in 11) is possible, a wider announcement audience may be selected.)		

UNCLASSIFIED  
SECURITY CLASSIFICATION OF FORM

13. **ABSTRACT** (a brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), or (U). It is not necessary to include here abstracts in both official languages unless the text is bilingual).

The office of the Chief of Defence Staff (CDS) requested a forecast of the age distribution of the Canadian Forces (CF), assuming current human resource policies and staff levels remain in effect. In order to accomplish this task within the time available, it was necessary to make a number of simplifying assumptions and these are documented here together with the results obtained from modelling the entire CF officer and non commissioned member (NCM) populations over 10 and 25 year time intervals.

Results indicate that, relative to the 1997 age distribution, an "age gap" will develop in both the officer and NCM populations. In the long run, this gap will largely disappear and the age distributions will flatten out.

14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus-identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

Military Human Resource Models  
Military Human Resource Policy  
Age Distributions  
Operational Research Models  
Military Personnel Databases  
Military Officers  
Military Non-Commissioned Members

UNCLASSIFIED  
SECURITY CLASSIFICATION OF FORM

Canada<sup>+</sup>

#509887