



Analysis of the Proposed Implementation of the new Army Communications and Information Systems Specialist (ACISS) Trade using the Managed Readiness Simulator (MARS)

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Centre for Operational Research & Analysis

Force Readiness & Air Systems Section

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Abstract

The Army is in the process of restructuring the Signals Non-Commissioned Members occupations to create a new Army Communication & Information Systems Specialist (ACISS) occupation by combining the current Land Communications and Information Systems Technician; Signal Operator; and Lineman occupations. In order to validate the complex ACISS structure concept and to optimize the implementation and sustainment of this new occupation, the Managed Readiness Simulator (MARS) program was used to conduct some population modelling analysis. The ACISS structure along with a proposed intake and training plan were successfully modelled in MARS for a 12 year period. Preliminary results showed that it would take approximately nine years to fill most of the vacant positions in the ACISS structure due to bottlenecks in the training system indicating that the proposed training plan was inadequate to support the proposed intake plan. Proposals to address these bottlenecks were then examined along with proposed reductions to the intake plan to prevent trained recruits from being unable to find a job in the ACISS structure. The result of the proposed changes was an ACISS structure filled in approximately half the time of the initial training proposal and one that allowed virtually all new recruits to find a position in the ACISS structure. Finally, it was recommended that MARS be run both periodically and whenever changes are proposed to forecast potential issues with the ACISS occupation so that Canadian Forces (CF) management has the opportunity to address the issues in a timely manner with a better understanding of the potential risks.

Résumé

L'Armée de terre procède actuellement à la restructuration du métier des transmissions des militaires du rang en vue de créer un nouveau groupe professionnel militaire (GPM) de spécialistes des systèmes de communication et d'information de l'Armée de terre (SSCIAT) en combinant les professions actuelles de technicien des systèmes d'information et de communications terrestres, d'opérateur des transmissions et de monteur. Afin de valider le concept complexe de la structure du GPM SSCIAT et d'optimiser la mise en œuvre et le maintien de ce nouveau groupe professionnel, on a utilisé le programme de simulation de la disponibilité opérationnelle (MARS) pour effectuer une analyse de la modélisation des effectifs. À l'aide de ce programme, on a modélisé avec succès la structure du GPM SSCIAT ainsi que les plans de recrutement et d'instruction prévu, pour une période de 12 ans. Les résultats préliminaires indiquaient que cela prendrait environ neuf ans pour doter la plupart des postes vacants dans la structure du GPM SSCIAT, compte tenu des goulots d'étranglement dans le système d'instruction, et montrant que le plan d'instruction proposé était inapproprié pour appuyer le plan de recrutement proposé. On a ensuite examiné les propositions visant à trouver une solution à ces goulots d'étranglement ainsi que les réductions proposées pour le plan de recrutement, afin d'éviter que les recrues nouvellement formées ne soient dans l'impossibilité de trouver un emploi dans la structure du GPM SSCIAT. Les modifications proposées ont permis d'avoir une structure du GPM SSCIAT où les postes seraient comblés dans environ la moitié du temps initialement prévu dans le plan d'instruction, et où presque toutes les nouvelles recrues trouveraient un poste. Enfin, on a recommandé que le programme MARS soit exécuté périodiquement et chaque fois que des modifications sont proposées pour prévoir les questions potentielles relatives au

GPM SSCIAT, de façon à que les gestionnaires des FC aient la possibilité de résoudre ces questions en temps opportun et en comprenant bien les risques potentiels.

Executive summary

Analysis of the Proposed Implementation of the new Army Communications and Information Systems Specialist (ACISS) Trade using the Managed Readiness Simulator (MARS)

Michael Ormrod; Stephen Okazawa; Christine Scales; DRDC CORA TM 2011-194; Defence R&D Canada – CORA; November 2011.

Background: The Army is in the process of restructuring the Signals Non-Commissioned Members occupations under the direction of the Director of Land Command and Information (DLCI). The plan is to create a new Army Communication & Information Systems Specialist (ACISS) occupation by combining the current Land Communications and Information Systems Technician; Signal Operator; and Lineman occupations. This new structure is made up of a parent occupation and four sub-occupations. Three of the sub-occupations will contain specialized Technologists ranked from Corporal to Sergeant. They will be referred to as the Communication Systems Technologist; Information Systems Technologist; and Line Systems Technologist. The fourth, a single capping sub-occupation ranked from Warrant Officer to Master Warrant Officer will be referred to as the Communication & Information Systems Technology Manager. At the Chief Warrant Officer rank, the member will be employed in the parent occupation.

The successful implementation of ACISS is dependent on a number of critical factors. In order to validate the complex ACISS structure concept and to optimize the implementation and sustainment of this new occupation, DLCI approached the Defence Research & Development Canada – Centre for Operational Research & Analysis, in May 2010, with a need to conduct some population modelling analysis using the Managed Readiness Simulator (MARS) program.

After discussions with DLCI, it was determined that the objectives of the proposed project were to:

1. Model the proposed ACISS structure concept within MARS to allow the concept to be validated and the effects of proposed changes to be evaluated;
2. Analyze the proposed intake plan and training schedule to determine how long it will take for the occupation to reach its preferred manning level;
3. Analyze the proposed intake plan and training schedule to determine whether the occupation is sustainable in the long run, i.e. if it can produce enough personnel with appropriate qualifications at each rank to meet the demand; and
4. Recommend ways to improve and optimize the proposed plan.

Results: The ACISS structure along with a proposed intake and training plan were successfully modelled in MARS for a 12 year period. Preliminary results indicated that it would take approximately nine years to fill most of the vacant positions in the ACISS structure due to bottlenecks in the training system that limited the number of possible promotions, which consequently affected the rate at which members moved between the ranks and Developmental Period (DP) levels. The effect of these bottlenecks also prevented new recruits from being able to enter the ACISS structure as there were no entry-level positions available at the DP1 level (3799

Job Group) indicating that the proposed training plan was inadequate to support the proposed intake plan.

Proposals to address these bottlenecks were then examined by analyzing a second scenario in which the number of students allowed in specific courses was increased and some additional courses were run in the first year to model the effect of the proposed changes. With this adjusted training plan, MARS forecasted that the ACISS structure would be fully manned in approximately five years, and that all new recruits would be able to find positions for the first three years after which the intake plan would exceed the number of unfilled positions plus the expected attrition. The intake plan was then reduced to 320 in the fourth year and reduced again in the fifth and following years to an estimated steady state intake value of 156, which resulted in almost all new recruits being able to find a position in the ACISS structure. The result of the proposed changes was an ACISS structure filled in approximately half the time of the initial training proposal and one that allowed virtually all new recruits to find a position in the ACISS structure. More analysis would be required to determine if the system could be further optimized.

Significance: The Army now has a model of the ACISS structure that can be used to forecast the effect of upcoming missions, new attrition rates, or proposed changes to the structure, training schedule, or intake plan. Other factors, not modelled in this analysis, could easily be added to provide a more detailed result. This model could also be used to examine other occupations.

Future plans: It is recommended that:

1. The proposed training and/or intake plan be adjusted to reduce or remove the bottlenecks in the promotion system and to ensure new recruits are able to find an entry position in the ACISS structure; If the proposed intake of 384 is to be sustained, it is recommended that:
 - a. The capacity of the 5600, 5601, 3801, and 4943 courses required to be transferred from the DP1 to the DP2 level be increased by a factor of 1.5;
 - b. The capacity of the 3950 course be doubled and the 4045 course be increased by a factor of 1.5; and
 - c. The intake and training plans be re-evaluated and reduced in the fourth year to prevent new recruits from being unable to enter the ACISS structure and to modify the training course schedule to reflect the reduction in new recruits;
2. Once equivalencies to the previous occupational qualifications have been established, the effect of these equivalent qualifications be addressed and that the proposed training course schedule be modified or additional courses be considered to ensure that eligible students can be found for the first serials of new ACISS courses. This will prevent courses from having to be cancelled during the first year due to a lack of eligible students; and it will reduce the time required for the ACISS structure to be fully manned;
3. Other factors be modelled to determine what effect they will have on the training system and on the overall ACISS structure such as:
 - a. The operational tasks that will place competing demands on the members; and

- b. The Canadian Forces (CF) leadership courses required for promotion;
- 4. All of the proposed ACISS courses be modelled to determine their effect on student and instructor availability and potentially determine whether the Canadian Forces School of Communications and Electronics (CFSCE) has the capacity to run all of the proposed serials;
- 5. The ACISS structure along with the current intake plan, training course schedule, operational tasks, and attrition rates be analyzed using MARS both periodically and whenever changes are proposed to forecast potential issues with the ACISS occupation so that CF management has the opportunity to address the issues in a timely manner with a better understanding of the potential risks.

Sommaire

Analysis of the Proposed Implementation of the new Army Communications and Information Systems Specialist (ACISS) Trade using the Managed Readiness Simulator (MARS)

Michael Ormrod; Stephen Okazawa; Christine Scales; RDRDC CORA TM 2011-194; R & D pour la défense Canada – CORA; Novembre 2011

Introduction ou contexte : L'Armée de terre procède actuellement à la restructuration du groupe professionnel des transmissions des militaires du rang, sous la supervision du Directeur – Commandement et information terrestre (DCIT). Le but est de créer un nouveau groupe professionnel militaire (GPM) de spécialistes des systèmes de communication et d'information de l'Armée de terre (SSCIAT) en combinant les professions actuelles de technicien des systèmes d'information et de communications terrestres, d'opérateur des transmissions et de monteur. La nouvelle structure se compose d'un groupe professionnel principal subdivisé en quatre sous-groupes. Trois des quatre sous-groupes seront composés de techniciens spécialisés de grades allant de caporal à sergent. On les appellera des technologues des systèmes de communications, des technologues des systèmes d'information et des technologues des systèmes de ligne. Le quatrième sous-groupe, un sous-groupe professionnel autonome de grades allant d'adjudant à adjudant-chef, sera composé de gestionnaires de systèmes de technologie de l'information et des communications. Au grade d'adjudant-chef, le militaire sera affecté au groupe professionnel principal.

Le succès de la mise en œuvre du GPM SSCIAT dépend d'un certain nombre de facteurs essentiels. Afin de valider le concept complexe de la structure du GPM SSCIAT et d'optimiser la mise en œuvre et le maintien de ce nouveau groupe professionnel, le Directeur – Commandement et information terrestre (DCIT) a demandé au Centre de recherche opérationnelle et d'analyse de Recherche et développement pour la défense Canada, en mai 2010, d'effectuer une analyse de la modélisation des effectifs à l'aide du programme de simulation de la disponibilité opérationnelle (MARS).

Après des discussions avec le DCIT, il a été établi que le but de ce projet était de :

1. modéliser le concept de la structure du GPM SSCIAT proposé à l'aide du programme MARS afin de le valider et d'évaluer les effets des modifications proposées;
2. analyser le plan de recrutement et le calendrier d'instruction afin de déterminer le temps que cela prendra pour que le GPM atteigne son niveau de dotation préféré;
3. analyser le plan de recrutement et le calendrier d'instruction afin de déterminer la viabilité à long terme du groupe professionnel, i.e. sa capacité à produire le personnel qualifié qui rencontre les besoins de la demande à chacun des grades, et
4. recommander des moyens d'améliorer et d'optimiser le plan proposé.

Résultats : À l'aide du programme MARS, on a modélisé avec succès la structure du GPM SSCIAT ainsi que les plans de recrutement et d'instruction prévus, pour une période de 12 ans. Les résultats préliminaires indiquent que cela prendrait environ neuf ans pour doter la plupart des postes vacants dans la structure du GPM SSCIAT, compte tenu des goulots d'étranglement dans le système d'instruction limitant le nombre de promotions possibles, ce qui a

pour conséquence de restreindre la vitesse à laquelle les militaires passent d'un grade à un autre et d'une période de perfectionnement (PP) à une autre. Ces goulots d'étranglement ont également pour effet d'empêcher les nouvelles recrues d'entrer dans la structure du GPM SSCIAT, car il n'y avait pas de postes de premier échelon disponibles au niveau de la PP1 (groupe d'emplois 3799), ce qui indique que le plan d'instruction proposé était inadéquat pour appuyer le plan de recrutement prévu.

On a ensuite examiné des propositions visant à trouver une solution à ces goulots d'étranglement en analysant un deuxième scénario où le nombre de stagiaires inscrits à des cours particuliers a été augmenté et où des cours supplémentaires ont été offerts au cours de la première année afin de modéliser l'effet des changements proposés. Grâce à ce plan d'instruction rajusté, le programme MARS a prévu que la structure du GPM SSCIAT serait entièrement dotée dans environ cinq ans, et que toutes les nouvelles recrues pourraient trouver des postes pour les trois premières années, après lesquelles le nombre de recrues prévu serait supérieur au nombre de postes non comblés, y compris ceux résultant de l'attrition prévue. Le nombre de recrues a ensuite été ramené à 320 pour la quatrième année et a été aussi réduite pour la cinquième année et les années suivantes pour être établi à un état stable d'environ 156 recrues, ce qui a donné comme résultat que presque toutes les nouvelles recrues pourraient trouver des postes dans la structure du GPM SSCIAT. Les modifications proposées ont permis d'avoir une structure du GPM SSCIAT où les postes seraient comblés dans environ la moitié du temps initialement prévue dans le plan d'instruction et où presque toutes les nouvelles recrues trouveraient un poste. Il faudrait effectuer d'autres analyses afin de déterminer si le système pourrait être optimisé davantage.

Importance : L'Armée de terre a maintenant un modèle de structure du GPM SSCIAT qui peut être utilisé pour prévoir l'effet des missions à venir, les nouveaux taux d'attrition ou les changements proposés à apporter à la structure, le calendrier d'instruction ou le plan de recrutement. D'autres facteurs, qui n'ont pas été modélisés lors de l'analyse, peuvent être ajoutés pour avoir un résultat plus détaillé. Ce modèle pourrait également être utilisé pour examiner d'autres groupes professionnels.

Perspectives : Il est recommandé :

1. que le plan d'instruction et/ou le plan de recrutement prévus soient rajustés afin de réduire et de supprimer les goulots d'étranglement dans le système de promotion et de faire en sorte que les nouvelles recrues puissent trouver un poste de premier échelon dans la structure du GPM SSCIAT; si le plan de recrutement prévu de 384 recrues doit être maintenu, il est recommandé :
 - a. de multiplier par 1,5 la capacité d'instruction pour les cours 5600, 5601, 3801 et 4943 qui sont requis pour passer du niveau PP1 à celui de PP2,
 - b. de multiplier par 2 la capacité d'instruction pour le cours 3950 et par 1,5 pour le cours 4045,
 - c. de réévaluer et réduire les plans de recrutement et d'instruction au cours de la quatrième année afin d'éviter que des nouvelles recrues ne puissent pas trouver de

- postes dans la structure du GPM SSCIAS, ainsi que de modifier le calendrier des cours pour tenir compte de la réduction du nombre de nouvelles recrues;
2. qu'une fois que les équivalences avec les qualifications des groupes professionnels précédents aient été établies, que l'effet de ces qualifications équivalentes soit remis en question et le calendrier de plan de cours proposé modifié en conséquence ou encore que des cours supplémentaires soient rajoutés, afin de s'assurer de trouver tous les stagiaires admissibles à la première série de cours du GPM SSCIAT. Cela évitera que l'on ait à annuler des cours à cause du manque de stagiaires admissibles et réduira le délai requis pour que la structure du GPM SSCIAT soit entièrement dotée;
 3. que l'on modélise d'autres facteurs afin de déterminer l'effet qu'ils auront sur le système d'instruction et sur la structure globale du GPM SSCIAT, notamment :
 - a. les tâches opérationnelles qui occasionneront des demandes concurrentes sur les militaires,
 - b. les cours des FC sur le leadership requis pour avoir une promotion;
 4. que l'on modélise tous les cours proposés pour le GPM SSCIAT afin de déterminer leur effet sur la disponibilité des stagiaires et des instructeurs et éventuellement si l'École d'électronique et des communications des Forces canadiennes (EECF) a la capacité d'offrir tous les cours proposés;
 5. que la structure du GPM SSCIAT ainsi que le plan de recrutement actuel, le calendrier des cours de formation, les tâches opérationnelles et les taux d'attrition soient analysés, à l'aide du programme MARS, périodiquement et chaque fois que des modifications sont proposées pour prévoir les questions potentielles relatives au GPM SSCIAT, de façon que les gestionnaires des FC aient la possibilité de résoudre ces questions en temps opportun et en comprenant bien les risques.

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1 Introduction

1.1 Army Communications & Information Systems Specialist (ACISS) Occupation

The Army is in the process of restructuring the Signals Non-Commissioned Members (NCM) occupations under the direction of the Director of Land Command and Information (DLCI). The plan is to create a new Army Communication & Information Systems Specialist (ACISS) occupation by combining the current Land Communications and Information Systems Technician (LCIS Tech), Signal Operator (Sig Op); and Linemen (LMN) occupations. This new structure is made up of a parent occupation and four sub-occupations. Three of the sub-occupations will contain specialized Technologists ranked from Corporal to Sergeant. They will be referred to as the Communication Systems Technologist (CST); Information Systems Technologist (IST); and Line Systems Technologist (LST). The fourth, a single capping sub-occupation ranked from Warrant Officer (WO) to Master Warrant Officer (MWO) will be referred to as the Communication & Information Systems Technology Manager (CISTM). At the Chief Warrant Officer (CWO) rank, the member will be employed in the parent occupation. The ACISS sub-occupations are shown in Figure 1.

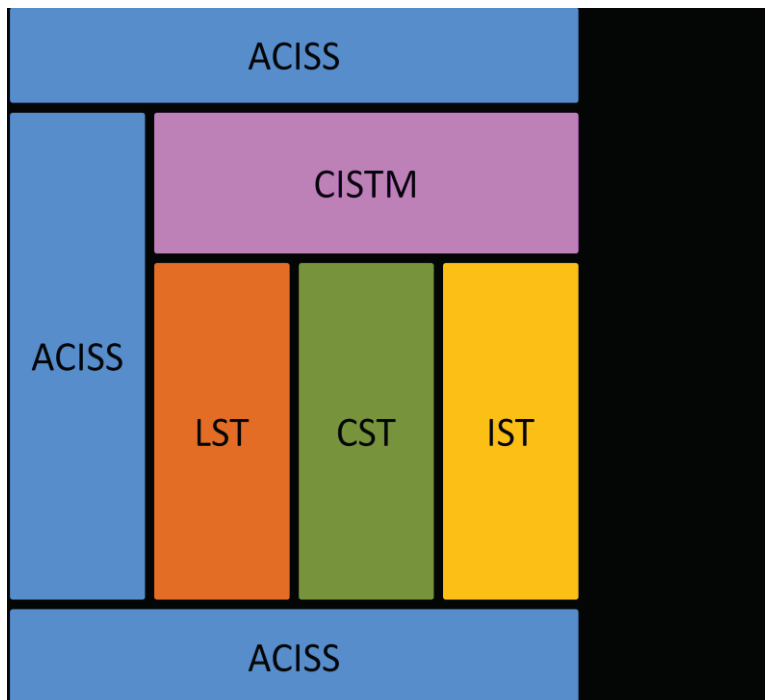


Figure 1: ACISS Sub-occupations

The formation of this new structure is expected to provide ACISS Military Employment Structure managers with the ability to more accurately identify the competencies required of personnel to perform specific jobs, the capability to develop and maintain highly specialized skill-sets, and the capacity to optimize personnel development. Additional benefits include: the potential to

introduce innovative Individual Training & Education strategies and the development of enhanced military personnel management capabilities; all of which will result in benefiting both the member and the organization by creating an interactive Continuous Learning Environment.

Once implemented, the ACISS occupation will allow personnel to have a greater say in the management of their careers. It will also provide the flexibility that allows Commanders to increase their capability to "Mission Tailor" resources and enhance their ability to address changing operational imperatives. Ultimately, the implementation of the new ACISS occupation should benefit the entire range of personnel considerations, from those of the individual through to those of the Canadian Forces (CF).

The main responsibilities of ACISS will be to support key Army functions such as: Land Command Support Systems, Land Force and Computer Network Operations. ACISS personnel also need to be managed within a Readiness Framework to be relevant to support Army operations.

The successful implementation of ACISS is dependent on a number of critical factors. In order to validate the complex ACISS structure concept and to optimize the implementation and sustainment of this new occupation, DLCI approached the Defence Research & Development Canada – Centre for Operational Research & Analysis (DRDC CORA), in May 2010, with a need to conduct some population modelling analysis using the Managed Readiness Simulator (MARS) program.

1.2 Objectives

After discussions with DLCI, it was determined that the objectives of the proposed project were to:

1. Model the proposed ACISS structure concept within MARS to allow the concept to be validated and the effects of proposed changes to be evaluated;
2. Analyze the proposed intake plan and training schedule to determine how long it will take for the occupation to reach its preferred manning level;
3. Analyze the proposed intake plan and training schedule to determine whether the occupation is sustainable in the long run, i.e. if it can produce enough personnel with appropriate qualifications at each rank to meet the demand; and
4. Recommend ways to improve and optimize the proposed plan.

1.3 Data

DLCI provided data on the ACISS organizational structure, current personnel, proposed training plan, and the strategic intake plan. The expected attrition data was provided by Director General Military Personnel Research and Analysis (DGMPPRA).

1.3.1 ACISS Job Positions

The data provided on the ACISS organization contained the requirements of 3250 job positions. Each position was described in terms of its identifier (Posn ID), location, title, job code, rank

requirements, and qualifications (Quals). An example of the data provided is shown in Table 1 and a summary of the number of positions by job code is provided in Annex A.

Table 1: Sample of Position Data

Posn ID	Location	Job Title	Job Code	Rank	Quals
Posn-3982	CFJSR	NCCIS Tech	3955	Cpl	3955, 5600
Posn-71	MARLANT HQ	Tac Line Sys Spec	4052	C-P	4052
Posn-338	CFB Halifax	Spec Comm Sys Tech	3894	Cpl	3894, 5600
Posn-1016	RCD	Crypto Adm Sys Spec	4203	Cpl	4203, 4943
Posn-12	CFB Esquimalt	Tac Comm Sys Det Comd	3818	MCpl	3818, 5659
Posn-1468	1 RCR	Unit Tac Line Det Comd	3809	MCpl	3809, 4048
Posn-124	742 Comm Sqn	C2 Net Designer	3952	Sgt	3952, 4019
Posn-211	CFB/ASU Valcartier	Ops WO	3789	WO	3789, 4045
Posn-1688	5 Svc Bn	C2 Sys Plan	3871	MWO	3871, 4945
Posn-239	CFB/ASU Montréal	RSM	4865	CWO	4865, 4945

The client also provided diagrams of the ACISS organizational structure that grouped the various jobs according to which sub-occupation they belonged by rank/developmental period (DP). The diagrams also indicated the qualifications required to enter a particular group of jobs. An example of the information provided for the DP2 level is illustrated in Figure 2. This information contained in these diagrams was incorporated into the data provided in Annex A.

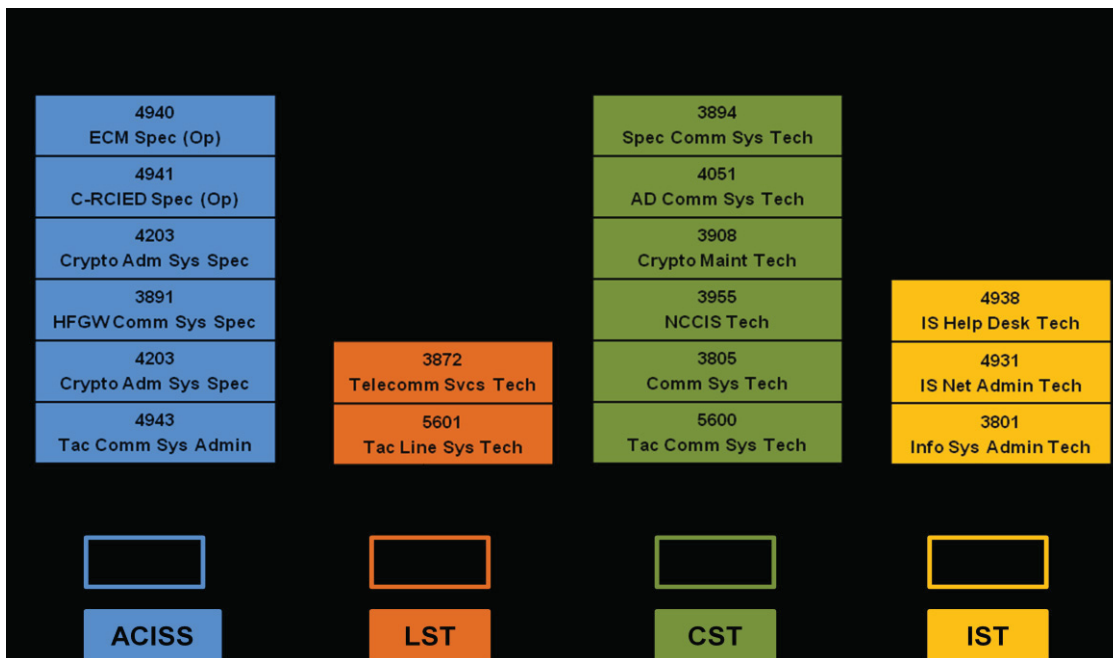


Figure 2: ACISS Structure Showing Job Codes and Course Requirements for DP2 Level

1.3.2 ACISS Personnel

A population snapshot of 2550 CF members who were in service in the LCIS Tech, Sig Op and LMN occupations as of August 2010 was provided by the client. The data provided included a unique identifier (Pers ID), their rank, time in rank (TIR), years of service (YOS), and qualifications (Mbr Qual). It also identified which position in the ACISS structure they are currently occupying (Posn ID). A sample of the personnel data provided is shown in Table 2. A Posn ID followed by empty cells indicated that the position was unfilled. In total, information defining 2550 personnel was provided, indicating that 700 positions were unfilled. A summary of the personnel by job code is provided in Annex A.

The qualifications provided by DLCI were assigned with the assumption that the members in the positions only had the necessary qualifications for their positions. However, this assignment was based on the minimum qualification requirements and did not necessarily reflect the actual training level of the individuals who may have additional qualifications. This is a worst case scenario for eligibility for promotion and training where these are dependent on prerequisite qualifications. The actual training level of the members is not currently available because equivalencies to the previous occupational qualifications have yet to be established.

Table 2: Sample of Personnel Resource Data provided by the client

Posn ID	Pers ID	Mbr Rank	TIR	YOS	Mbr Qual
Posn-3982	Pers-3175	PteR	30	2.50	3955, 5600
Posn-71	Pers-75	PteT	7	8.83	4052
Posn-338	Pers-4	PteT	10	3.33	3894, 5600
Posn-1016	Pers-793	Cpl	34	6.83	4203, 4943
Posn-12	Pers-33	MCpl	13	4.67	3818, 5659
Posn-1419	Pers-1056	MCpl	96	33.2	3809, 4048
Posn-124					
Posn-211	Pers-172	WO	24	21.00	3789, 4045
Posn-1688					
Posn-239	Pers-190	CWO	49	32.00	4865, 4945

1.3.3 Proposed Training Plan

The Canadian Forces School of Communications and Electronics (CFSCE) provided the course data for the proposed training plan. Each course corresponds to a particular qualification and is characterized by a unique course code, a rank, duration, a number of serials being proposed, and a minimum/maximum number of students required (Course Load). The data corresponding to all the courses modelled for the analysis conducted for this report are shown in Table 3. These courses correspond to only those required for personnel to acquire the qualifications necessary for promotion to the next level.

Table 3: Proposed Training Course Structure

Level	Course Code	Duration (Days)		Courses/Year	Course Load (Min/Max)
		Training	Calendar		
Recruit	3799	75	103	16	12/24
DP1	4052	53	73	4	8/16
DP1	3791	39	53	6	8/16
DP1	4969	35	47	6	6/12
DP2	5659	25	33	16	12/24
DP2	4943	15	19	11	6/12
DP2	5601	114	158	3	8/16
DP2	5600	107	149	3	8/16
DP2	3801	87	121	4	6/12
Sgt	3817	35	47	6	12/24
Sgt	3832	15	19	6	6/12
Sgt	4158	35	47	2	6/12
Sgt	4019	35	47	2	6/12
Sgt	4967	20	26	2	6/12
WO	4045	30	40	3	12/24
WO	3950	90	124	2	6/12

Also provided was a schedule indicating the month when each course serial was going to be run during the year. The proposed schedule for the courses listed above is shown in Table 4.

Table 4: Proposed Training Course Schedule

Level	Course	#/yr	JA	FE	MR	AP	MY	JN	JL	AU	SE	OC	NO	DE
Recruit	3799	16	2	2	2		2	2	2		2	2		
DP1	4052	4		1			1			1			1	
DP1	3791	6	1		1		1		1		1		1	
DP1	4969	6	1		1		1		1		1		1	
DP2	5659	16	2			2	2	2		2	2	2		2
DP2	4943	11	1	1	1	1	1	1	1	1	1	1	1	
DP2	5601	3	1						1			1		
DP2	5600	3	1			1				1				
DP2	3801	4		1			1			1			1	
Sgt	3817	6	1		1		1		1		1		1	
Sgt	3832	6		1		1		1		1		1		1
Sgt	4158	2		1						1				
Sgt	4019	2		1							1			
Sgt	4967	2		1							1			
WO	4045	3			1			1					1	
WO	3950	2				1					1			

1.3.4 Strategic Intake Plan

The strategic intake plan (SIP) proposed by the client was to expect 400 new recruits per year until the ACISS structure was filled and then to reduce the intake to a steady state number to deal with the forecasted attrition.

1.3.5 Attrition

The average attrition percentages forecasted for the ACISS trade provided by DGMPPRA are based on the combined historical attrition data for the LCIS Tech, Sig Op, and LMN occupations from fiscal year 03/04 to fiscal year 08/09. The attrition percentages were given for both the Private to Sergeant (Pte-Sgt) and Warrant to Chief Warrant Officer (WO-CWO) ranks based on YOS and are shown in Figure 3.

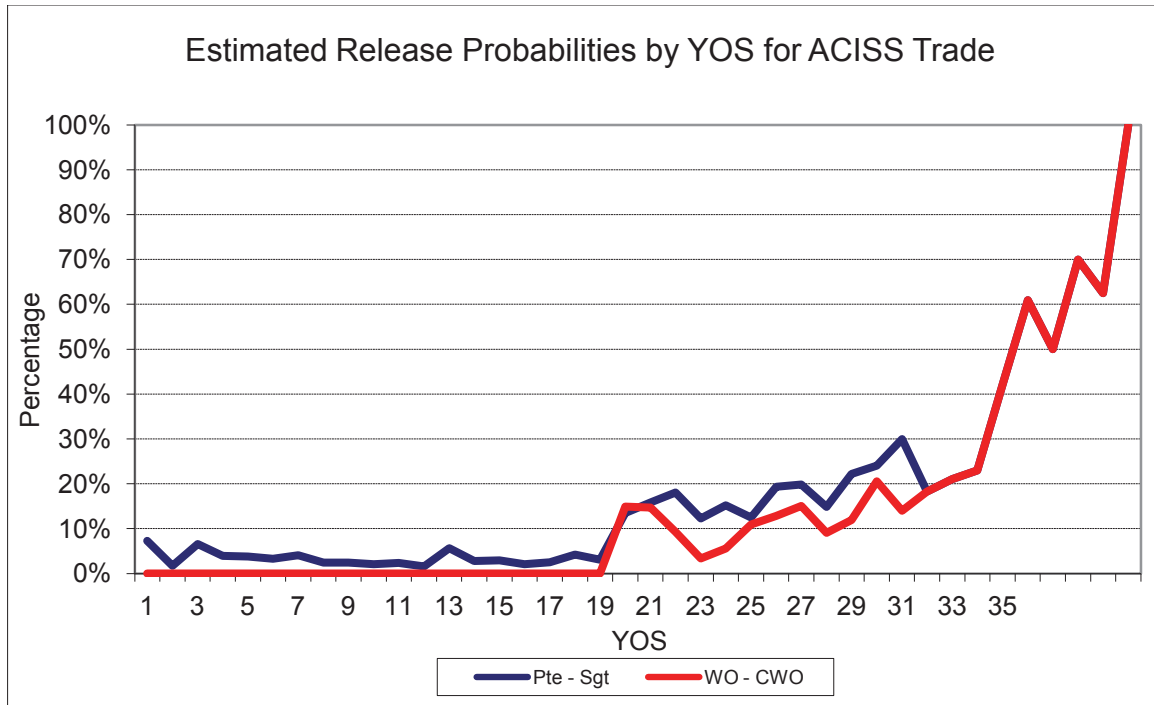


Figure 3: Attrition data for ACISS trade

1.4 The MARS Model

The Managed Readiness Simulation Tool (MARS) was chosen to conduct the simulation runs required to conduct the analysis. The MARS program is designed to simulate a given readiness *Scenario* by forecasting the ability of an *Establishment* to generate the *Resources* required to satisfy a set of *Tasks* occurring over time under a given set of conditions. The program also records the state of every Resource throughout the simulation; therefore the results can be used to determine the utilization level of a unit within the Establishment or of a specific group of Resources.

From the outputs generated by the MARS simulation, the extent to which the Establishment was able to supply the Resources required for all the Tasks being modelled can be measured. Similarly, the states of the Resources within the Establishment can be tracked over time. These results can be combined to plot the state over time of a selected group of Resources, a unit or group of units, or the entire Establishment. A more complete explanation of the model can be found in References [1] and [2].

1.5 Assumptions

The following factors were not considered in this analysis:

1. Transfers into and out of the ACISS occupation, either component or from other occupations, were not considered;

2. Operational tasks that would prevent individuals from being available to take courses were not modelled;
3. Individuals chosen for promotion were randomly selected from the pool of candidates who met the promotion requirements;
4. Except for the parent ACISS occupation, once a member entered a sub-occupation, they remained in that sub-occupation;
5. All DP1 and DP2 positions were assumed to have the rank requirement of Corporal-Private Basic (Cpl-PteB);
6. It was assumed that new recruits had already obtained their basic military qualifications and were eligible to be enrolled in courses needed to enter the ACISS trade; and
7. The members only had the minimum qualifications required to be in their current positions.

2 Modelling Considerations

2.1 Job Positions

To make it easier to model the career progression in the ACISS occupation and to handle the large number of different jobs, the jobs were placed into Job Groups (JobGrps) based on the organizational diagrams provided by the client and explained earlier in Section 1.3.1. Essentially this grouped all the jobs with the same rank, parent/sub-occupation and qualification requirements together. In most cases, the name chosen for each JobGrp was based on the course qualification required to be promoted into a job within the group. For example, if one considers the IST jobs at the Developmental Period (DP) 2 level shown in Figure 2, the 4938, 4931, and 3801 jobs were placed in the 3801 JobGrp because the 3801 qualification was a requirement for all three. Table 5 shows the JobGrps at the DP1 level. The complete list is given in Annex A.

The position data provided in Section 1.3 included job-specific qualifications. DLCI indicated that an individual could be promoted into a job with just the qualification for the JobGrp and then acquire any job-specific qualification while in the position. Therefore, the job-specific qualifications were not modelled.

Table 5: JobGrps at the DP1 Level

Job Group	Job Code	Job Title	Positions
3799 JobGrp	3799	ACISS Det Mbr	162
	3959	Commcen Spec	53
	4937	NCCIS Spec	19
	4944	LOS Comm Sys Spec	30
4052 JobGrp	4052	Tac Line Sys Spec	83
3791 JobGrp	3791	Tac Comm Sys Spec	75
	4179	ISR Spec	3
	3947	LOS Comm Sys Spec	3
	4934	FD Arty Comm Sys Spec	1
	3806	Crypto Maint Spec	1
4969 JobGrp	4969	IS Net Spec	100

2.2 Initial ACISS Population

After examining the initial ACISS population, it was found that some of the ranks of the current members did not match the required rank of their positions in the data provided. MARS has the capability to model individuals in these ‘acting-while-so-employed’ positions; but, to reduce the modelling effort required to account for these possibilities, a decision was made to alter the ranks of the current members to match the rank requirement of the positions that they are occupying. Table 6 summarizes the changes that were made. The initial data set contained 2550 current

members, of which one Officer Cadet (OCDT) was deleted and 116 had their rank adjusted. The distribution of the initial population by job is given in Annex A.

Table 6: Changes made to ranks in initial data

Required Rank	Rank Reduced	Rank Increased	Deleted	Rank Unchanged	Total
Cpl-PteB	21 MCpl → Cpl; 1 Sgt → Cpl	2 PteR → PteB	1 OCDT	1169 Pte/Cpl	1193
MCpl	21 Sgt → MCpl	24 Cpl → MCpl		650 MCpl	695
Sgt	14 WO → Sgt	11 MCpl → Sgt		322 Sgt	347
WO	6 MWO → WO	6 Sgt → WO		163 WO	175
MWO	6 CWO → MWO	3 WO → MWO		107 MWO	116
CWO		1 MWO → CWO		22 CWO	23

2.3 Courses

For this analysis, only the courses in the CFSCE training plan required for personnel to acquire the qualifications necessary for promotion were modelled. In addition, although MARS has the capability, the reader is reminded that the instructors, training facilities, and equipment required for each course were not modelled and the minimum course loads were not imposed. Only the students required for the courses were modelled. Students for each course were chosen at random from the pool of qualified candidates.

2.4 Promotions

Except for personnel in the Cpl-Pte ranks, promotions within the ACISS model occurred when a position became available at the upper rank. An individual was promoted if he/she had the required qualifications based on the data described above and the required TIR as defined by Canadian Forces Administrative Order (CFAO) 49-4 (Reference [3]). The individual chosen for promotion was selected randomly from the pool of eligible candidates. For example, the member selected to fill a vacant Sgt position would be chosen randomly from all the Master Corporal (MCpl) members who had $TIR \geq 24$ months and had the qualification required to be eligible for the Sgt position. The TIR requirements used in the model are shown in Table 7.

Table 7: TIR Requirements for Promotion

Rank	TIR (months)	Promoted to
PteB	Equal to 30	PteT
PteT	Equal to 18	Cpl
Cpl	At least 24	MCpl
MCpl	At least 24	Sgt
Sgt	At least 36	WO
WO	At least 36	MWO
MWO	At least 24	CWO

The 18 month TIR requirement for the Private Trained (PteT) to Cpl promotion specified in the table may appear to differ from the 48 month requirement defined in the CFAO but in reality they are the same because one is based on TIR as a PteT and the other on TIR as a Pte.

The personnel data provided by DLCI assumed that an individual's TIR was reset to 0 when promoted from the PteB to PteT rank; therefore, the requirement based on TIR as a PteT was used. Individuals with a Private rank were automatically promoted to either a PteT or Cpl when they had the required TIR. In summary, a PteB automatically became a PteT after TIR = 30 months and a PteT became a Cpl after TIR = 18 months regardless of their current position. As positions became available at the MCpl level, Cpls that met the promotion criteria (TIR \geq 24 months, sub-occupation qualification) were randomly selected and promoted to MCpl. Promotions for higher ranks occurred in the same manner. Vacant positions in the highest rank were filled first, followed by the next highest rank and so forth; for example, promotions from MWO to CWO occurred first, followed by promotions from WO to MWO, etc. Promotions occurred every three months in the simulation, immediately after the attrition process.

2.5 Recruitment

Based on the course schedule provided by CFSCE, there are 16 serials of the 3799 course with a maximum student load of 24. This schedule will produce a maximum of 384 recruits in a year with the 3799 qualification which is the minimum qualification required to enter the ACISS organization. This maximum annual training capacity of 384 represents the upper limit on the number of possible recruits available to enter the ACISS organization. Since this was close to the proposed SIP of 400 allowing for some attrition within the first year, it was used in the model as the annual number of recruits enrolling in the 3799 course.

It was assumed that new recruits had completed their basic military training, had the rank of PteB, and were available to go on the 3799 course. It was also assumed that every 3799 course was fully loaded and that all 384 students completed and passed the course. After completing the 3799 course, recruits were assigned a TIR and YOS of 12 months and considered eligible to enter the ACISS organization and were then subject to attrition.

2.6 Attrition

As stated previously, the average attrition percentages for the ACISS trade were provided by DGMPPRA. The attrition percentages were given for NCMs by YOS. Implementing attrition for every YOS can be computationally intensive and was considered unnecessary; therefore it was decided to use a single attrition percentage for a fixed number of YOS ranges (termed YOS bands). Appropriate YOS bands were chosen to closely match the attrition data provided by DGMPPRA.

Table 8 shows the percentage attrition by YOS band used in the MARS ACISS simulation.

Table 8: Attrition percentages by YOS band used in MARS ACISS simulation

YOS Band	Percentage Attrition
YOS<2	7%
2≤YOS<5	5%
5≤YOS<9	3%
9≤YOS<20	2.5%
20≤YOS<35	15%
YOS≥35	40%

Figure 4 shows how the attrition calculated from the YOS bands used in MARS compares to the historical data provided by DGMPPRA.

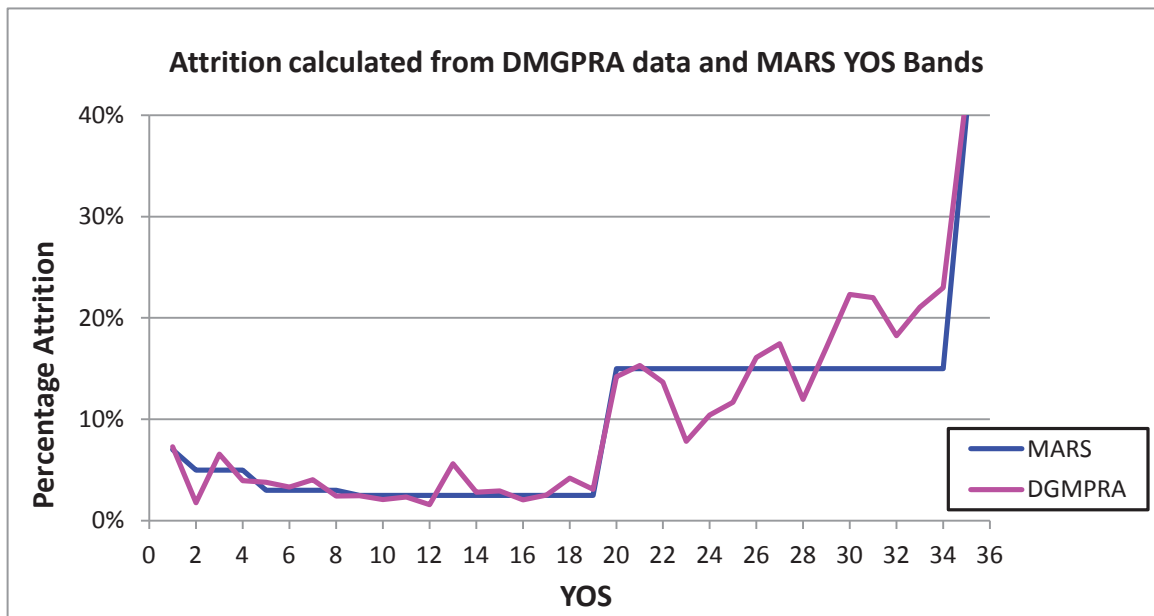


Figure 4: Comparison of Attrition per YOS calculated from DGMPPRA data and the YOS bands used in MARS

The attrition percentages for each YOS provided by DGMPPRA were applied to the starting ACISS population provided by DLCI and the number of members remaining at the end of each year, after recruitment and attrition were taken into account, was calculated for five years. These numbers were compared with the number of remaining members at the end of each year calculated using the YOS-band percentages recommended for use in the MARS ACISS simulation (applied four times a year). The comparison is shown in Table 9. The results indicated that the recommended YOS-band percentages produced results comparable to the results calculated using the historical data; therefore, these values were used in the simulation. In the MARS simulation, attrition occurred four times a year.

Table 9: Number of Members at the end of each year for five years

Year	DGMPRA	MARS	DGMPRA-MARS
0	2550	2550	0
1	2755	2761	-5
2	2959	2962	-3
3	3172	3160	12
4	3370	3354	16
5	3560	3541	19

2.7 Progression through the ACISS Structure

The proposed ACISS structure is shown in Figure 5. The figure illustrates the structure when it is organized by Job Group (JobGrp) and rank or DP level. It also shows the progression through the various JobGrps for the parent occupation and the LST, CST, IST, and CITSM sub-occupations described in Section 1.1. To make it easier for the reader to identify the sub-occupations throughout this Section, each is colour coded and identified on the bottom of each figure. Except for the 4943 JobGrp of the parent ACISS occupation, it was assumed that once a member entered a sub-occupation, they remained in that sub-occupation as indicated by the arrows in the figure. Each of the promotion or transfer points between rank or DP levels including the training requirements is discussed in the following paragraphs. It should be pointed out that although the proposed ACISS structure adheres to the typical structure of having fewer positions at higher rank levels, this typical structure is not followed in the CITSM sub-occupation. This inversion places additional pressure on management of the vacancies in the 3950 JobGrp which can have a direct impact on the health of the 3871 JobGrp. This pressure could be reduced by allowing members from the 3789 JobGrp to qualify and be considered for promotion within the 3871 JobGrp. A similar inversion exists between the 4943 and 3818 JobGrps in the parent occupation. Ways to deal with these issues are beyond the scope of this report and will not be discussed any further.

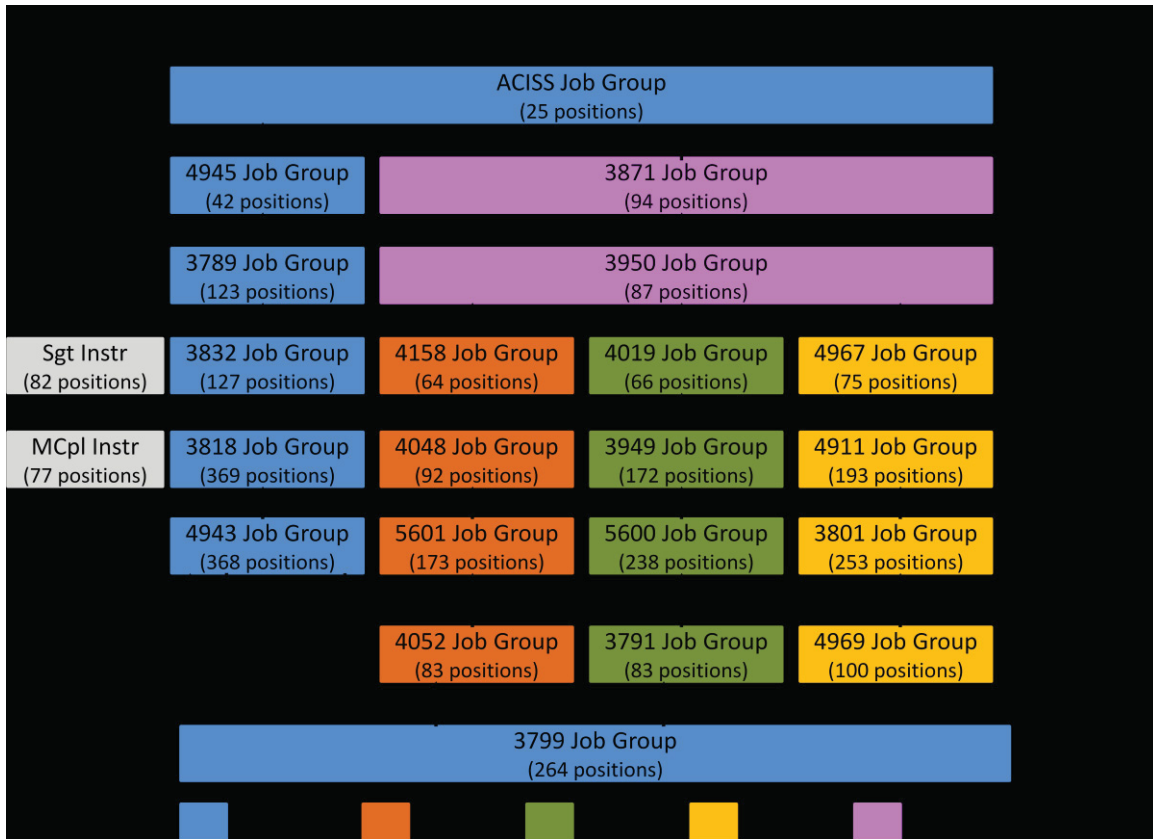


Figure 5: Proposed ACISS Organizational Structure

2.7.1 New Recruits through DP1 Level

Figure 6 shows the training requirements and JobGrps for new recruits through the DP1 level. As specified in Section 2.5, new recruits were assumed to have completed basic training; therefore, they were immediately available as students for the 3799 course. Once the recruits completed the 3799 course they became Trained Recruits and were considered as candidates for unfilled jobs in the 3799 JobGrp. They were also assigned a TIR and YOS of 12 months. From the 3799 JobGrp, personnel were eligible for the 4052, 3791, and 4969 courses. Personnel in this JobGrp were also considered as candidates for the unfilled positions in the 4052, 3791, and 4969 JobGrps if they had the necessary qualifications.

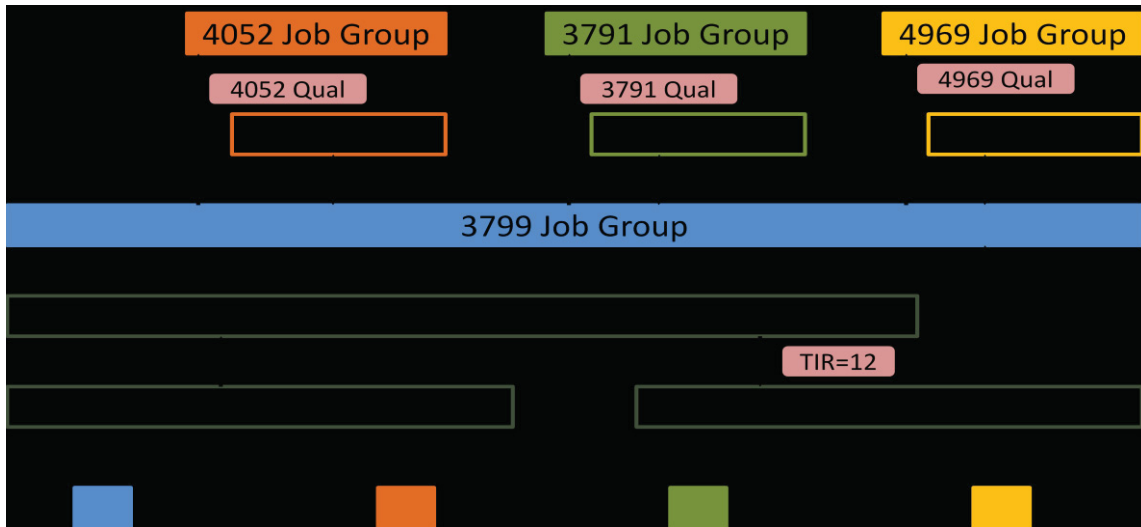


Figure 6: Organization of the ACISS trade for the new recruit to DP1 levels

2.7.2 DP1 Level through DP2 Level

Figure 7 shows the training requirements and JobGrps for the DP1 level through the DP2 level. Personnel in the 3799, 4052, 3791, and 4969 JobGrps were considered as candidates for the unfilled positions in the 4943, 5601, 5600, and 3801 JobGrps respectively if they had the necessary qualifications. Personnel in the 3799, 4052, 3791, and 4969 JobGrps were eligible for the 5659 course and they were also eligible for the 4943, 5601, 5600, and 3801 courses respectively if they had the 5659 qualification.

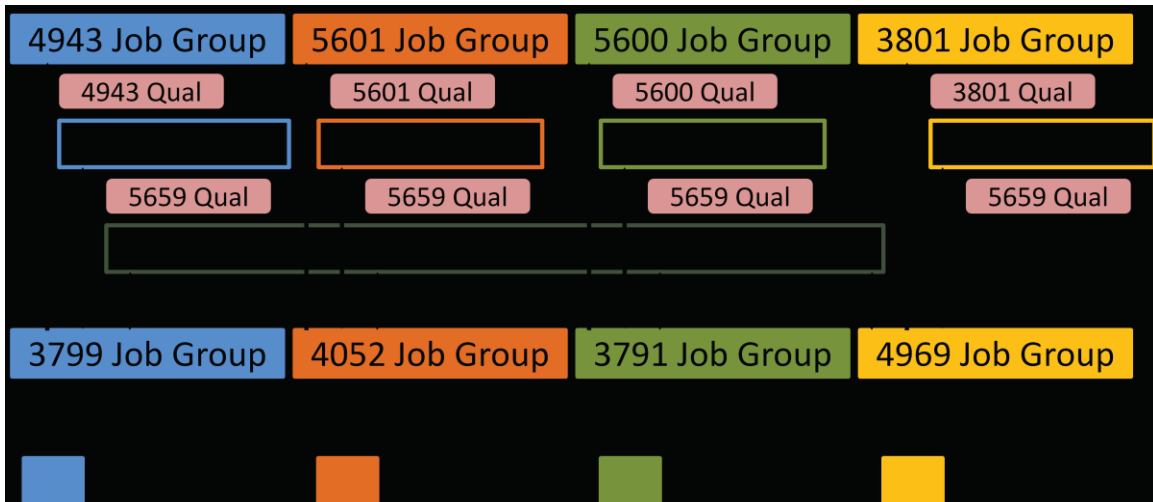


Figure 7: DP1 to DP2 Transfer

As mentioned previously, except for the parent ACISS occupation, members entering a sub-occupation remained in that sub-occupation. The personnel in the parent ACISS occupation at the DP2 level (4943 JobGrp) represent one of these exceptions. As shown in Figure 8, personnel in this JobGrp were eligible for the DP1 and DP2 courses of the LST, CST, and IST sub-occupations and were considered as candidates for unfilled positions in all DP1 and DP2 JobGrps if they had the necessary qualifications after all suitable candidates were chosen from within the sub-occupations. In other words, when job positions became available in the LST, CST and IST sub-occupations, qualified personnel were randomly selected first from within the sub-occupation and then from the parent ACISS occupation to fill the positions.

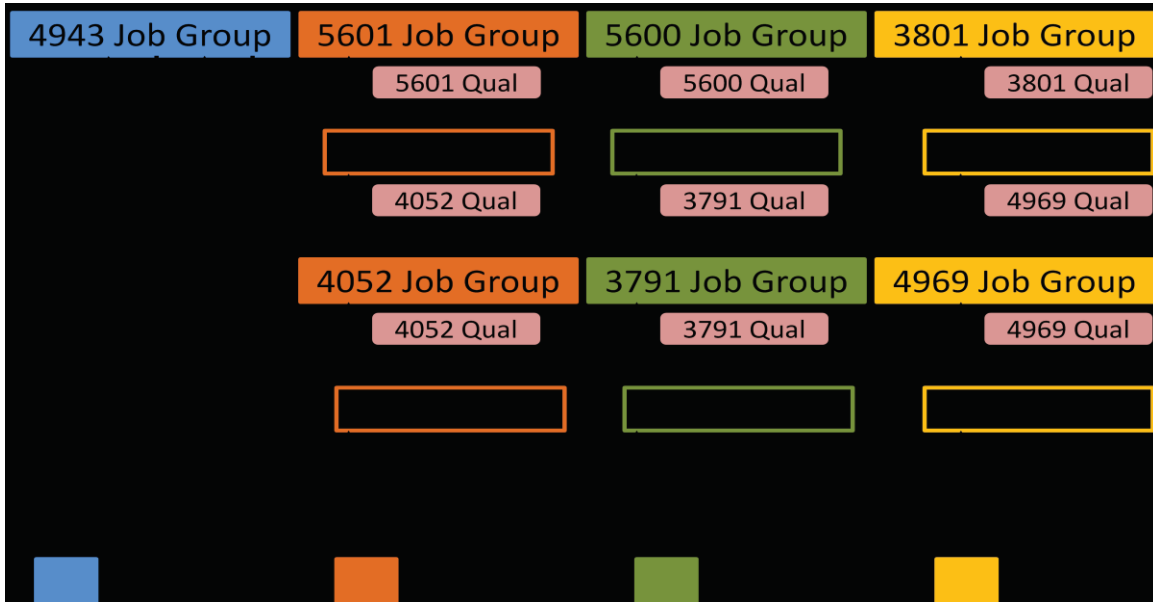


Figure 8: Options available to personnel in 4943 Job Group

2.7.3 DP2 Level through MCpl Level

Figure 9 shows the training requirements and JobGrps for the DP2 level through the MCpl level. At the MCpl level, personnel were selected from their respective sub-occupations. Corporals in the 4943, 5601, 5600, and 3801 JobGrps were considered as candidates for the unfilled positions in the 3818, 4048, 3949, and 4911 JobGrps respectively if they had the necessary TIR qualification. The vacant positions in the MCpl Instructor JobGrp shown in Figure 5 (not shown in the following diagram) were filled randomly from the other four MCpl JobGrps.

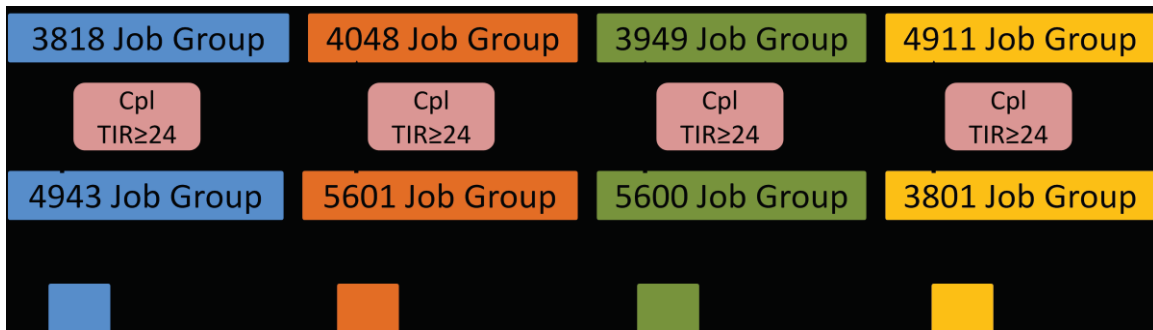


Figure 9: DP2 to MCpl Promotion

2.7.4 MCpl Level through Sgt Level

Figure 10 shows the training requirements and JobGrps for the MCpl level through the Sgt level. Personnel in the 3818, 4048, 3949, and 4911 JobGrps were considered as candidates for the unfilled positions in the 3832, 4158, 4019, and 4967 JobGrps respectively if they had the necessary TIR and sub-occupation qualifications. The vacant positions in the Sgt Instructor JobGrp shown in Figure 5 (not shown in the following diagram) were filled randomly from the other four Sgt JobGrps. Personnel in all five MCpl JobGrps were eligible for the 3817 course. Personnel in the 3818, 4048, 3949, and 4911 JobGrps were eligible for the 3832, 4158, 4019, and 4967 courses respectively if they had the 3817 qualification. Personnel within the MCpl Instructor JobGrp were considered as candidates for both courses and promotions within their respective sub-occupation as long as they met the requirements.

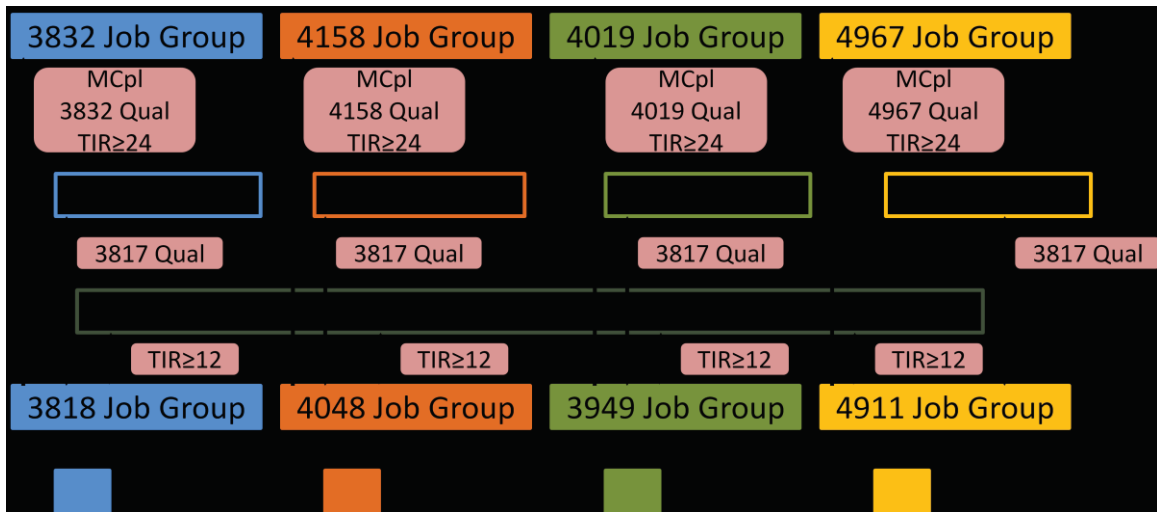


Figure 10: MCpl to Sgt Promotion

2.7.5 Sgt Level through WO Level

Figure 11 shows the training requirements and JobGrps for the Sgt level through the WO level. Personnel in the LST, CST and IST sub-occupations were considered as candidates for unfilled positions in the 3950 JobGrp, whereas unfilled positions in the 3789 JobGrp were filled from candidates from the 3832 JobGrp (and those Sgt Instructors who met the requirements). Naturally, candidates had to satisfy both the TIR and qualification requirements. Personnel in all Sgt JobGrps (including the Sgt Instructor JobGrp not shown) were eligible for the 4045 course. Personnel in the 4158, 4019, and 4967 JobGrps were eligible for the 3950 course if they had the 4045 qualification. Personnel within the Sgt Instructor JobGrp who were from one of the sub-occupations were also considered as candidates for the 3950 course and promotions as long as they met the requirements.

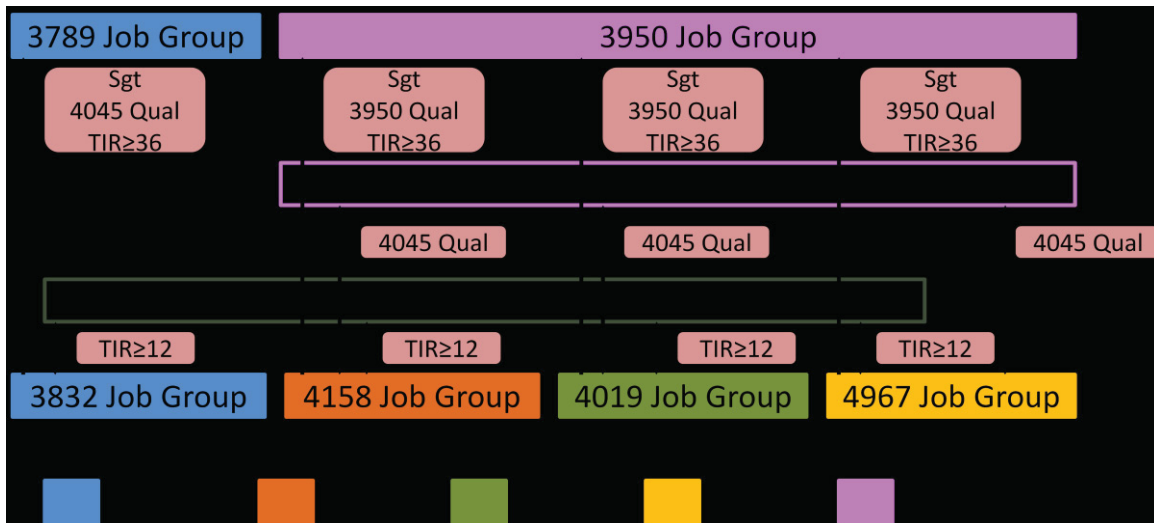


Figure 11: Sgt to WO Promotion

2.7.6 WO Level through CWO Level

Figure 12 shows the training requirements and JobGrps for the WO level through the CWO level. At the CWO level, all the sub-occupations merge together into the ACISS occupation. There were no course requirements modelled for progression through these levels. Personnel in the 3789 JobGrp were considered as candidates for unfilled positions in the 4945 JobGrp; and personnel in the 3950 JobGrp were considered as candidates for unfilled positions in the 3871 JobGrp as long as they met the TIR requirements. Unfilled positions in the CWO JobGrp were filled from candidates selected from either the 4945 or 3871 JobGrp who had been an MWO for at least 24 months.

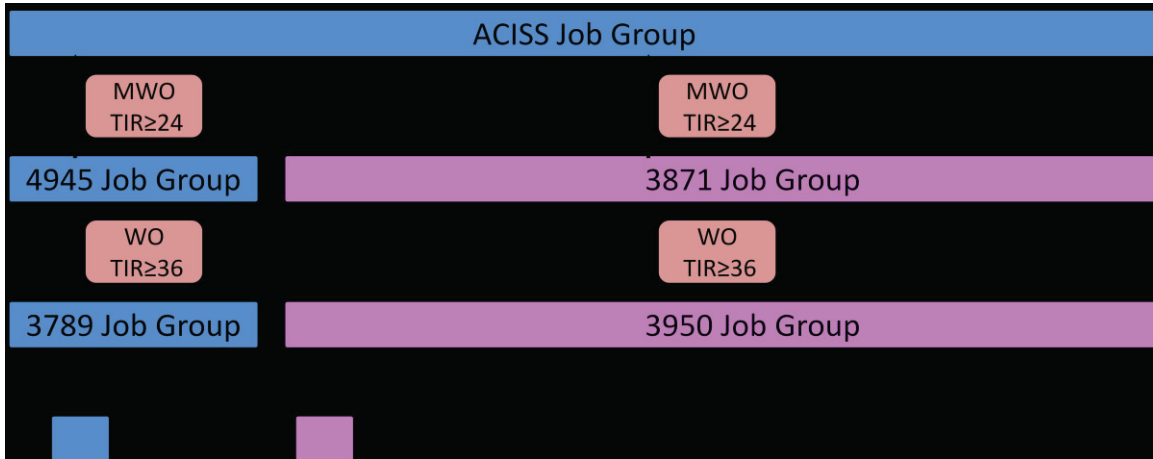


Figure 12: WO to CWO Promotion

3 Results

Based on the modelling considerations and on the input data discussed in Section 1, the flow of personnel in the new ACISS occupation was simulated over a 12 year period (starting on 1st January 2010) using the MARS model. The scenarios being analyzed are stochastic in nature due to the random simulation of promotions, attrition, and training. This implies that the simulation results will differ between runs of the same scenario. Typically, one would conduct a Monte Carlo style simulation where many runs would be performed and statistically analyzed to determine the average or expected outcome as well as the range of potential outcomes. For this analysis, the scenarios were run 10 times. There were no observable differences found between the outputs from the runs; therefore, the typical statistical analysis was not performed. The figures presented here are based on the output from one of the runs and can be assumed to be representative of the results of all the runs performed. It should also be pointed out that the step-like results shown in the figures discussed in this section are due to the fact that promotions and attrition occur every three months in the model.

3.1 Results with the Proposed Intake and Training Plan

As explained in Section 2.2, the simulation began with 2549 of the 3250 positions being filled by ACISS personnel with appropriate rank and qualifications. The results with the proposed intake and training plan over twelve years are shown in Figure 13. The figure indicates that the ACISS structure will almost be filled in approximately ten years but never actually fills every position. In the twelfth year there are still approximately 30 unfilled positions. (Note: of the ten runs performed, the number of remaining unfilled positions ranged from 19 to 42 with 30 being the average.) In the rest of this section, simulation results within ranks/DPs are analyzed in more detail in order to explain the observation in Figure 13.

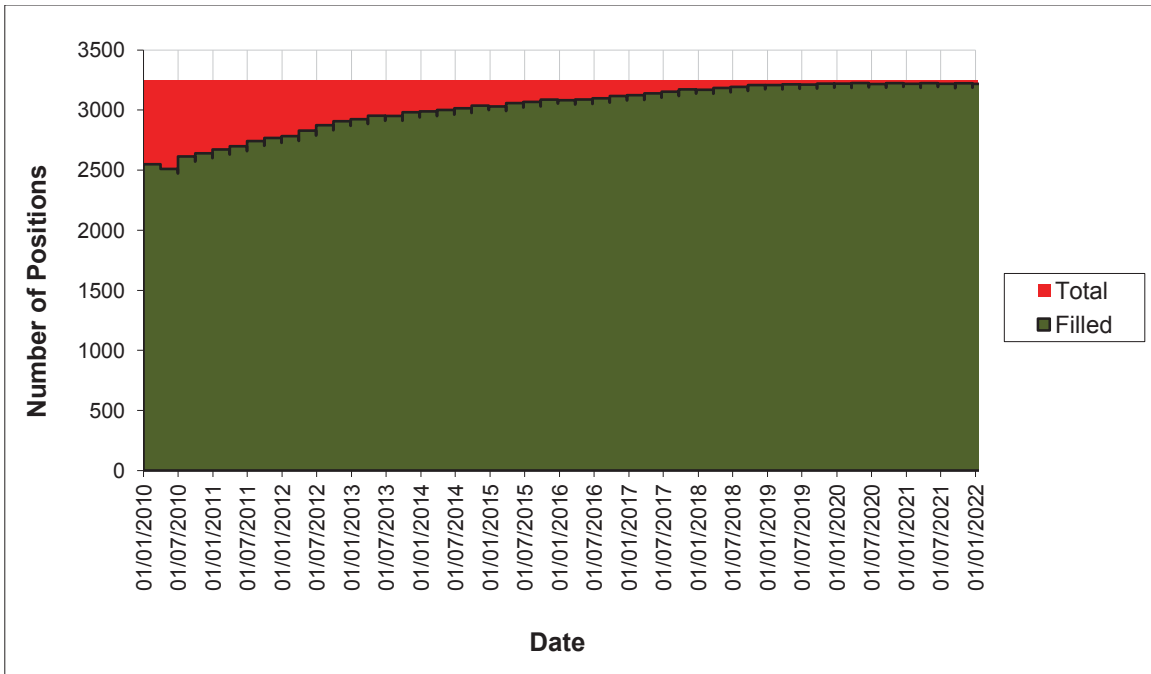


Figure 13: ACISS Positions filled in the Proposed Structure over 12 years

Figure 14 shows the trained recruits that are waiting to be placed in a job in the proposed structure over the first five years given the intake plan of 384 recruits per year. Just after the first year, the number of those waiting to be placed starts increasing, indicating that there are not enough vacant positions at the DP1 level for the trained recruits to enter the structure. By the end of the fifth year, there are over 500 new recruits waiting. Given the number of empty positions available in the ACISS structure, this indicates that there is a bottleneck in the promotion system.

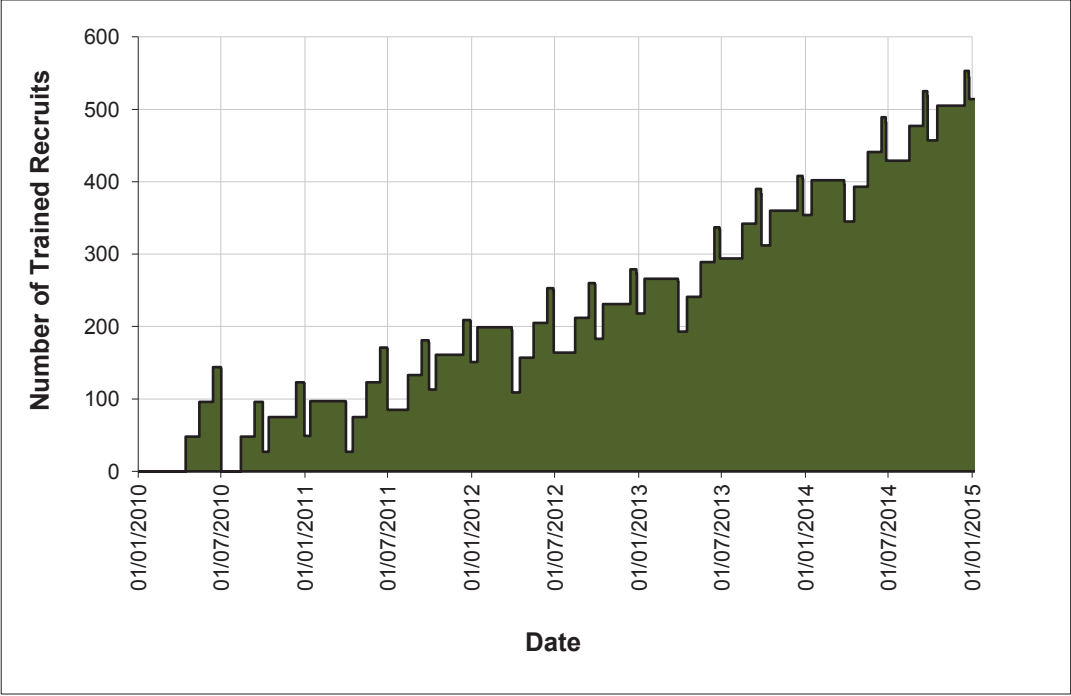


Figure 14: Trained Recruits waiting to enter the ACISS Structure over 5 years

Results of the positions filled at the DP1 level are shown in Figure 15. The figure shows that the 114 positions which are vacant at the beginning of the simulation at the DP1 level are filled in the first year and remain filled for the duration of the scenario.

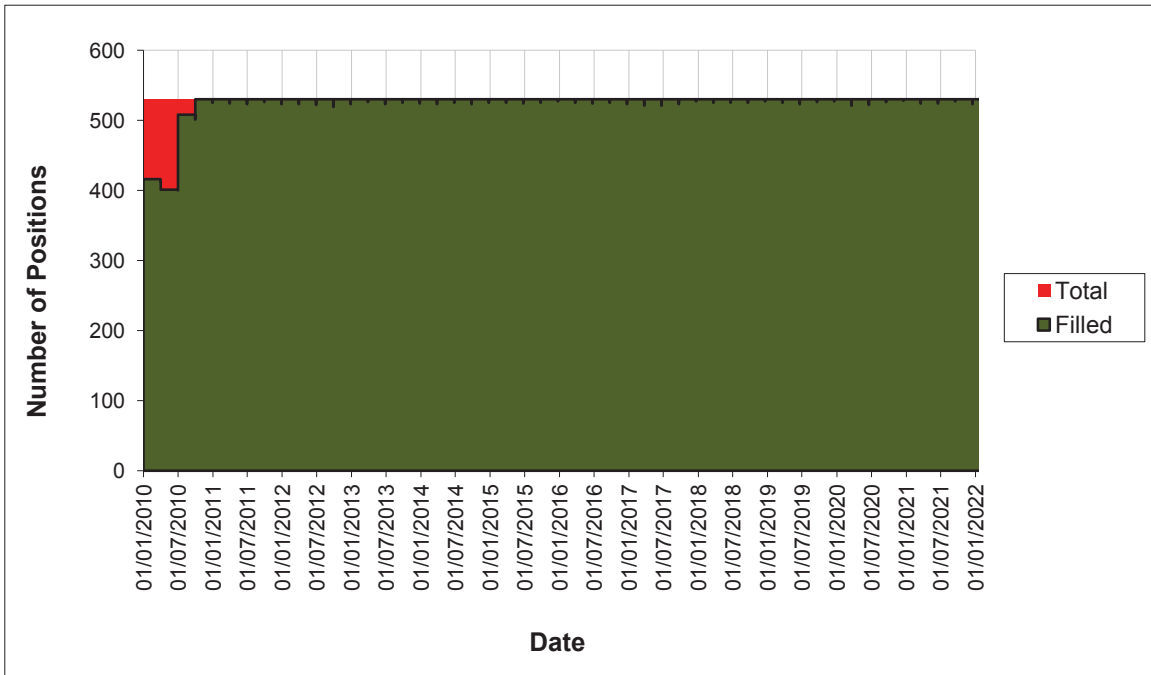


Figure 15: DP1 Positions Filled in the Proposed Structure over 12 years

A similar analysis of the vacant and filled positions at the DP2 level is shown in Figure 16. The figure shows that during the first three months of the simulation roughly 200 members are either promoted to MCpl or attrit, with a corresponding increase in the number of vacant positions at the DP2 level. After this period, the DP2 positions steadily fill up over a ten year period. Given that the DP1 positions are totally filled by the end of the first year, this indicates that the DP1 to DP2 transfer is a bottleneck in the career progression system. Furthermore, as there are no rank or TIR requirements needed to transfer from the DP1 to DP2 level, the bottleneck can be directly attributed to the number of members able to obtain the qualification required for transfer by taking the appropriate DP2 course. Considering that the attrition from the DP1 level is expected to be small, the minimum annual DP2 course load should be roughly equal to the number of new recruits expected to arrive in a year. It should be pointed out that the initial drop of approximately 200 members could be regulated by promoting a smaller number of Corporals eligible for promotion during the first three months and therefore increasing the number of vacant positions at the Master Corporal level.

As indicated in Figure 7, in order to transfer from the DP1 to DP2 level, a member must obtain both the compulsory 5659 qualification as well as the qualification for the chosen sub-occupation. Analysis of the proposed annual training schedule shows 16 serials of the 5659 course with a maximum course load of 24 students. This means that a maximum of 384 members at the DP1 level could acquire the compulsory 5659 qualification during a year, which corresponds to the maximum number of possible recruits per year (based on the capacity of the 3799 course). However, a similar analysis of the proposed annual training schedules for the four courses (4943,

5600, 5601, and 3801) requiring the 5659 course qualification reveals a maximum throughput of 276, which is inadequate to allow 384 members to transfer to the DP2 level. In order to increase the fill rate of the vacant DP2 positions shown in Figure 16, it is therefore recommended that the throughput for the DP2 courses be increased by a factor of one and a half to allow a minimum of 384 members to transfer to the DP2 level. Obviously this factor is dependent on the proposed SIP and the number of 5659 students and would have to be adjusted if changes are made.

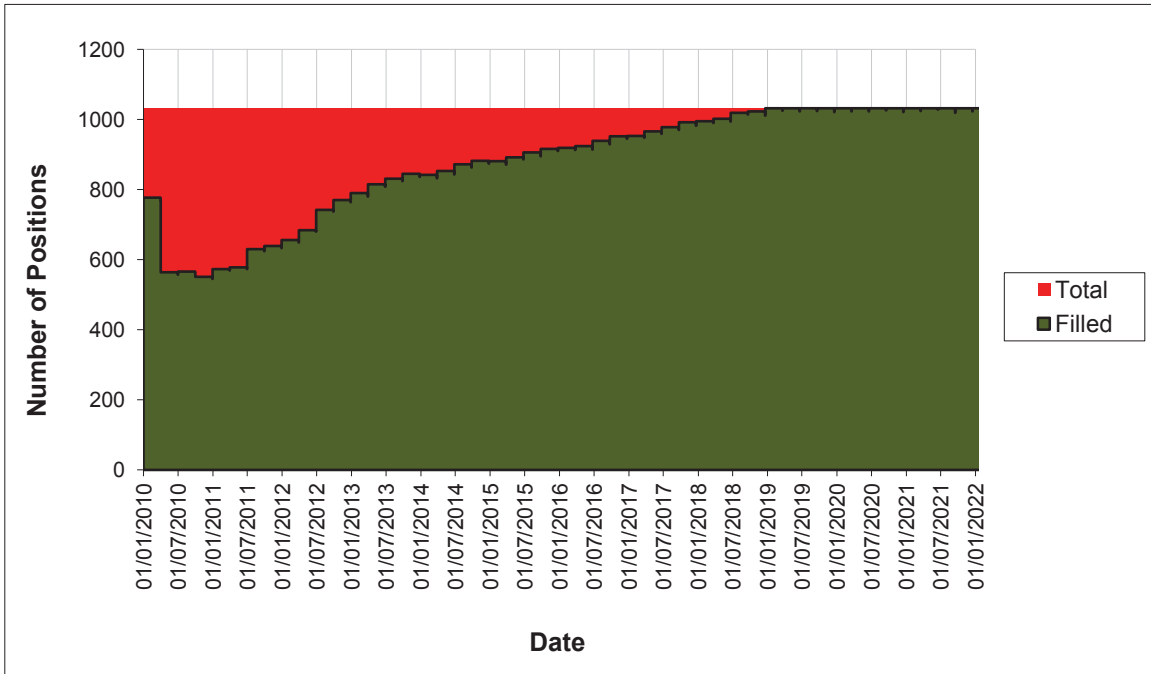


Figure 16: DP2 Positions Filled in the Proposed Structure over 12 years

Further analysis of the proposed course schedule revealed that, in some cases, when the training plan begins, it will not be possible for members to acquire the compulsory qualification in time to be candidates for the first serials of the follow-on sub-occupation course. For example, the number of students found in the first year of the DP2 sub-occupation courses (4943, 5600, 5601, and 3801) is shown in Figure 17. The results show that no students could be found for the first serial of three of these courses and that there was often difficulty in finding students for the second serial. The same results were also found in the courses required to be promoted from MCpl to Sgt and from Sgt to WO because of the need to obtain a compulsory qualification before being eligible to take the required sub-occupation course.

The lack of students for the first serials of courses requiring a compulsory qualification can be attributed to the initial assignment of qualifications. The reader is reminded that the assignment was based on the minimum qualifications required for the position and did not necessarily reflect the actual training level of the individuals. Once equivalencies to the previous occupational qualifications have been established, there should be individuals available with the required prerequisite qualifications for the first serials of these courses. It is recommended that the effect of these equivalent qualifications be addressed and that the training plan for the first year be modified accordingly, if necessary, to ensure that students are available when courses are scheduled.

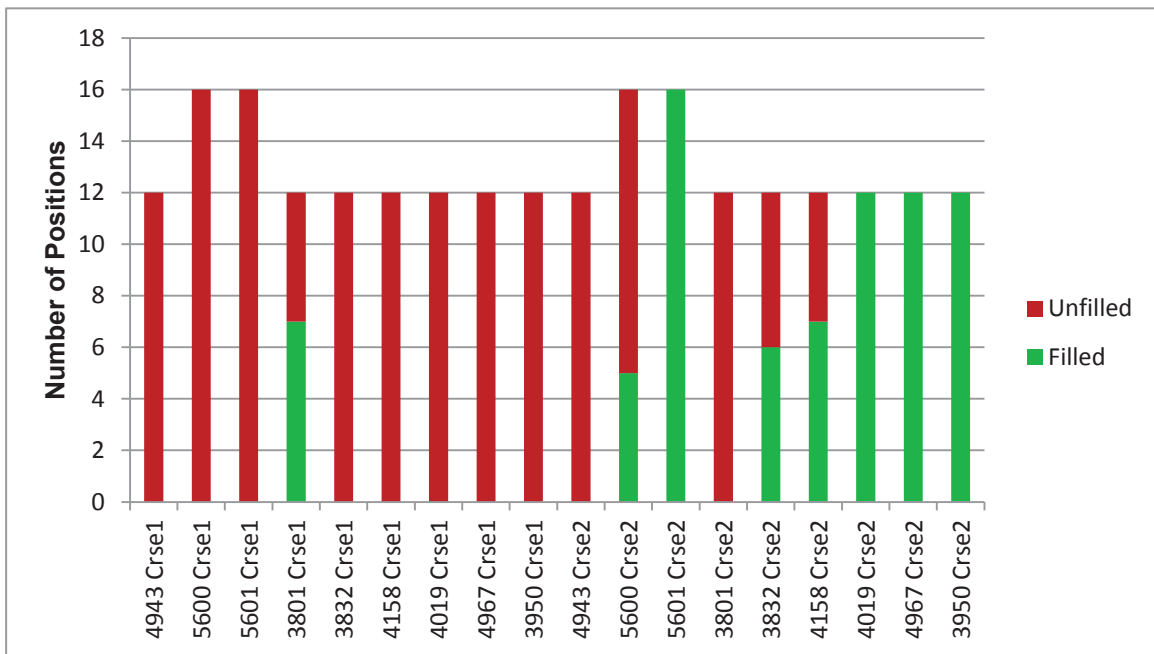


Figure 17: Student Positions Filled for the first two serials of follow-on courses

Results of the WO positions filled in the CITSM sub-occupation (3950 JobGrp) are shown below in Figure 18. The figure shows that the number of filled positions significantly decreases in the first year due to attrition and promotions of WOs to the rank of MWO. There are no promotions into this JobGrp during the first year because, as mentioned above, no Sergeant can acquire the compulsory 4045 qualification in time to be considered as candidates for the first serial of the 3950 course and the proposed annual training plan has only two serials with a maximum load of 12 students per course. After the third year, the number of filled positions starts to increase but eventually levels out at approximately 65 of the 87 positions indicating that there is a bottleneck in the Sgt to WO promotion process. Examination of the Sgt JobGrps in the sub-occupations that feed the 3950 JobGrp revealed that this outcome is a result of not having enough candidates with the 3950 qualification due to the maximum course load of both the 3950 and 4045 courses. In order to address this, it is therefore recommended that the capacity for these two courses be increased. As with the initial drop in filled positions at the DP2 level, the drop in 3950 positions filled could be regulated and balanced with the vacant positions at the MWO level by promoting a smaller number of WOs eligible for promotion during the first year. It should also be pointed out that this particular JobGrp will have to be managed closely as the number of CITSM MWO positions exceeds the number of CITSM WO positions and a WO requires three years TIR before being eligible for promotion. If the 3950 JobGrp is not well manned, there will not be enough eligible candidates to fill the CITSM MWO vacancies.

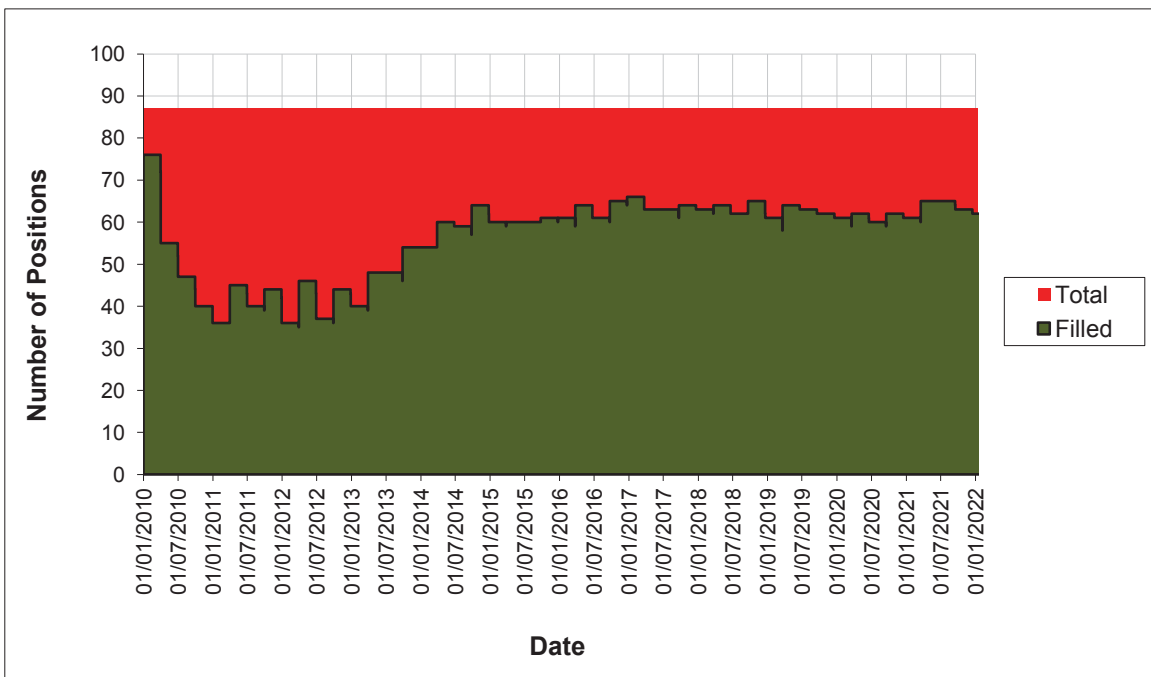


Figure 18: WO CITSM positions filled

3.2 Results with changes to proposed training plan

Based on the results of the above analysis, recommendations were made to address identified bottlenecks in the proposed training plan to increase the flow of personnel resources through the ranks, with the ultimate goal being to fill the ACISS trade in a timely manner and to minimize the possibility of new recruits being unable to find a position in the ACISS structure. To examine the potential effect of these recommendations, a second scenario was analyzed with changes made to the proposed training plan to address the recommendations. It is noted, that there are many ways to implement the recommendations; and the changes listed below are just one method to achieve them. This scenario was run for 10 iterations. As before, there were no observable differences found between the outputs from the runs; therefore, the following output is from one run and is assumed to be representative of the results of all the runs performed.

The changes made to address the recommendations were to:

1. Add extra courses in the first year to allow members to acquire the 5659, 4045, and 3817 compulsory qualification in time to make them eligible to fill the appropriate follow-on course according to their rank and sub-occupation. This change was made to address the issue related to the fact that the CF members in the starting population provided by the client do not have compulsory qualifications required to register in the first serials of follow-on course. The extra courses added included:
 - 5659 courses for 144 additional students with the following student break down: 24 from LST sub-group, 48 from CST sub-group, 36 from IST sub-group, and 36 from ACISS parent group;
 - 3817 courses for 72 additional students with the following student breakdown: 24 from LST sub-group, 12 from CST sub-group, 12 from IST sub-group, and 24 from ACISS parent group; and
 - 4045 courses for 24 additional students from the LST, CST, and IST sub-groups at the Sgt level
2. Increasing course loads for DP2 courses by 1.5 to 24 students for the 5600 and 5601 courses and to 18 students for the 3801 and 4943 courses. This change was made to address the bottleneck identified at the DP2 level by increasing the throughput from the DP1 to the DP2 level; and
3. Increasing 4045 course load by 1.5 to 32 students and increasing 3950 course load by 2 to 24 students. This change was made to address the bottleneck identified at the WO level by increasing the number of Sgts eligible for promotion.

The overall result of the proposed changes is shown in Figure 19, which indicates that the ACISS structure could be completely manned in five years. This represents a significant improvement in the time required to fill the ACISS structure when compared to the original plan under which the occupation was almost filled in roughly 10 years. It also demonstrates the impact a particular training plan can have on the recovery of an occupation.

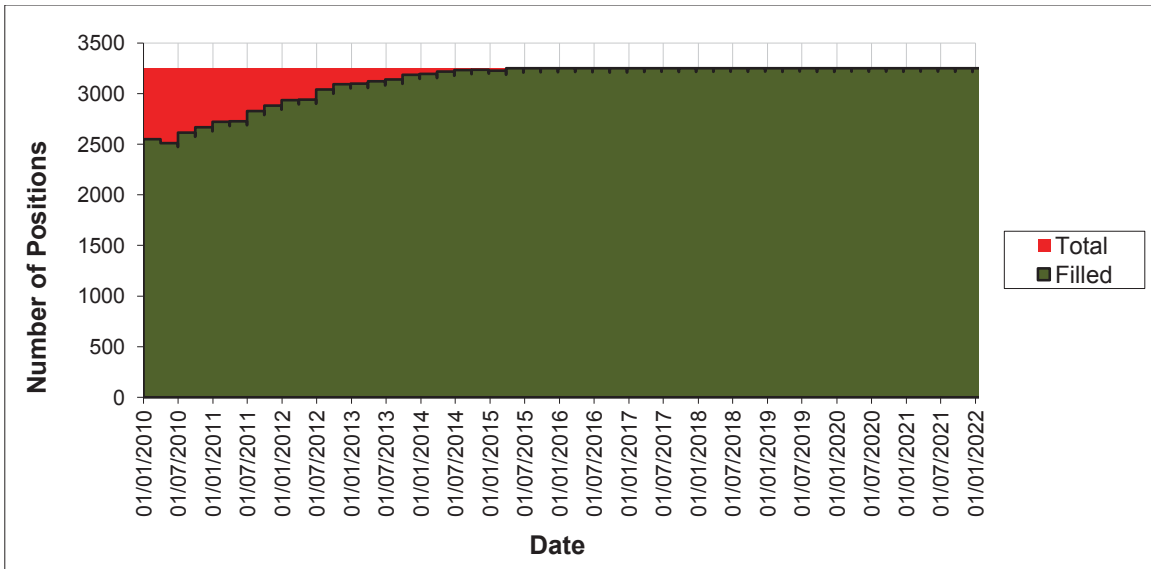


Figure 19: ACISS Positions filled over 12 years after proposed changes

Figure 20 shows the effect of the proposed changes on the number of trained recruits who are waiting to find a position in the ACISS structure. When compared with Figure 14, a noticeable improvement can be seen. Now the number of recruits waiting to be placed starts increasing in the fourth year as opposed to the second year in the original plan. Also in the fourth year, the number of recruits remaining begins to exceed the number of available positions within the ACISS structure indicating that the intake plan needs to be reduced as the original 700 vacant positions have now been filled.

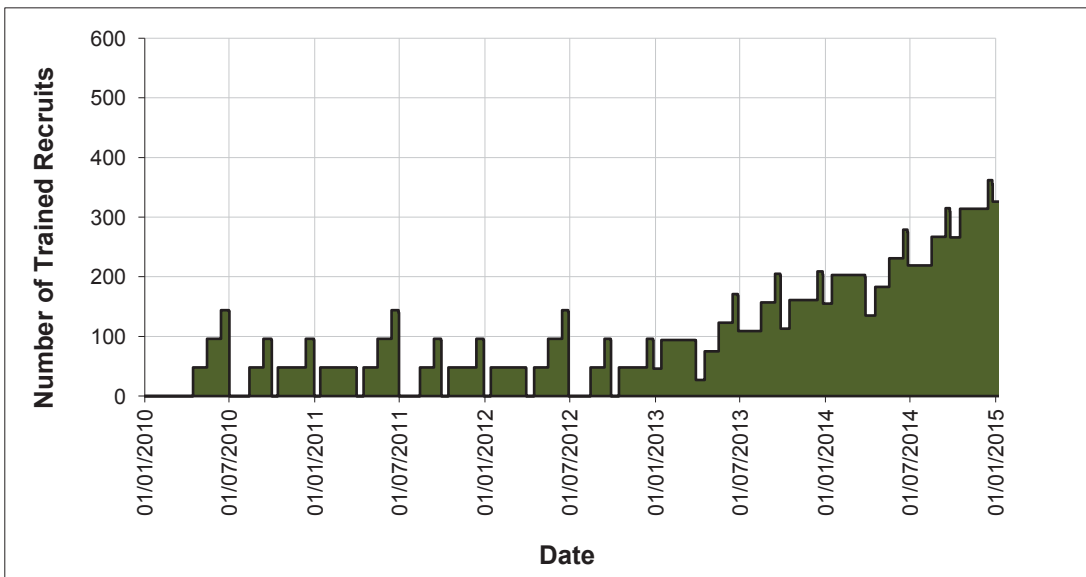


Figure 20: Trained recruits waiting to be placed in a job over 5 years after proposed changes

The effect of the proposed changes on the DP2 JobGrps can be seen in Figure 21. Compared to Figure 16, the initial drop in positions filled due to promotions of Cpls to MCpls and attrition remains, but then the number of filled DP2 positions steadily increases until all the positions are filled in approximately four years time compared to the original forecast of nine years. This improvement is due to the increase in the number of students who can register in the DP2 level courses.

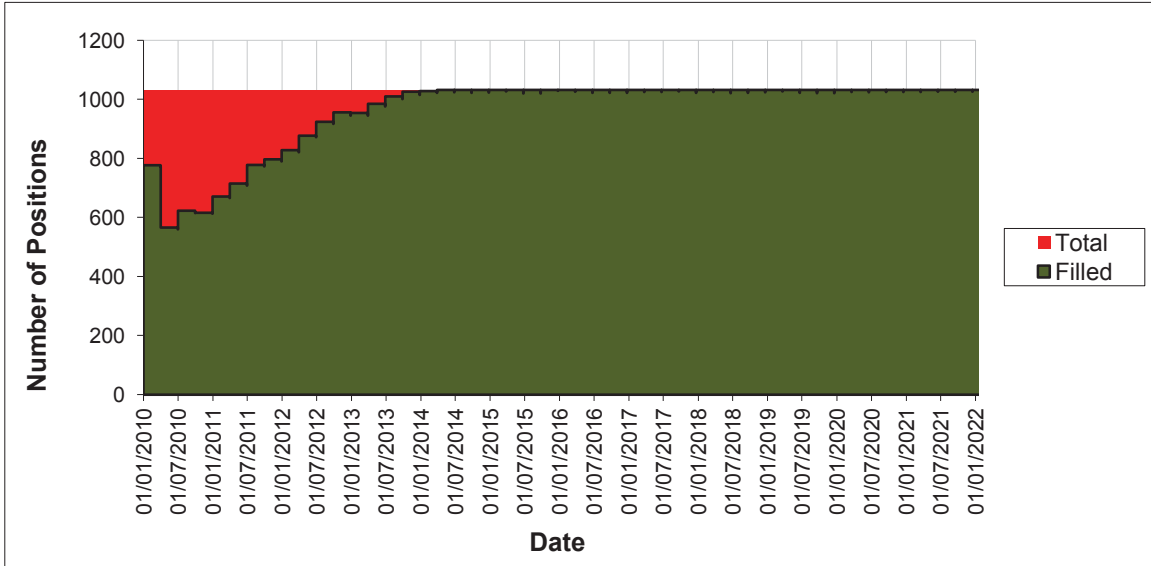


Figure 21: DP2 JobGrp Positions filled over 12 years after proposed changes

A similar improvement was found in the WO CITSM (3950) JobGrp as can be seen when comparing the results from the proposed changes shown in Figure 22 to the original results seen in Figure 18. With the proposed changes to increase the throughput of the 3950 and 4045 courses, the 3950 JobGrp is completely filled after three years, whereas using the original plan, this JobGrp was never filled over the 12 year period.

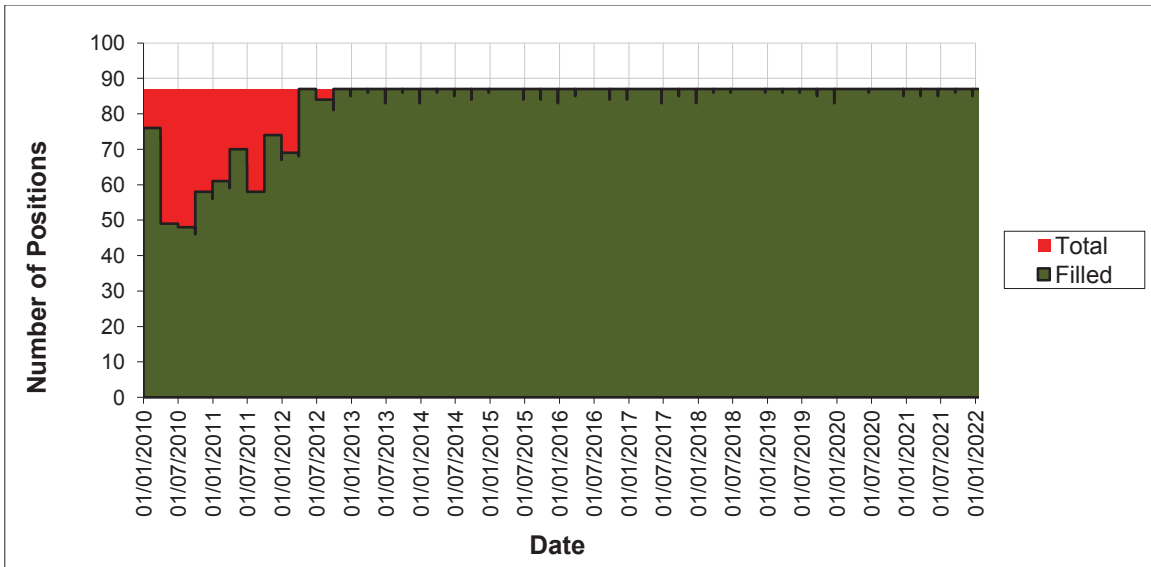


Figure 22: WO Positions filled over 12 years after proposed changes

The effect of running additional courses to ensure there were eligible candidates for the first serials of those courses requiring a prerequisite qualification can be seen in Figure 23. Almost all courses were completely filled, which represents a significant improvement compared to the original results shown in Figure 17 and contributed to the speed at which the ACISS structure filled all of its positions with the proposed changes. These changes simulate the effect of equivalent qualifications being assigned to the starting population.

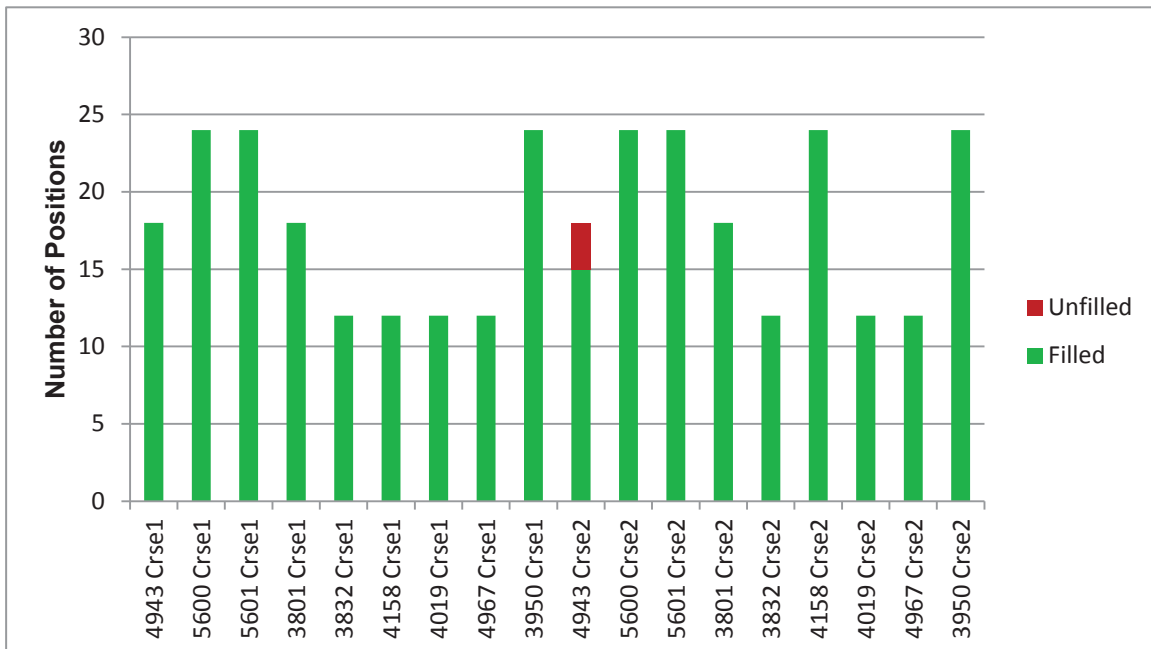


Figure 23: Student Positions Filled for follow-on courses after proposed changes

3.2.1 Other Impacts

After increasing the throughput from the DP1 to DP2 level, the manning levels of the DP1 JobGrps were re-examined and the results are shown in Figure 24. When compared to the initial results shown in Figure 15, one can see that it is now taking longer to fill all the DP1 positions due to the increased throughput from the DP1 to DP2 level. Further examination revealed that the increased throughput results in there not being enough members with the 4969 qualification to fill the vacancies in the 4969 JobGrp. This indicates the vacancies could be filled quicker if there were more 4969 courses. This sort of analysis can be repeated as one tries to further optimize the system, but its primary purpose was to point out the fact that the entire structure must be analyzed as a whole as changes to improve one part of the structure can have impacts on other parts and they are not always positive.

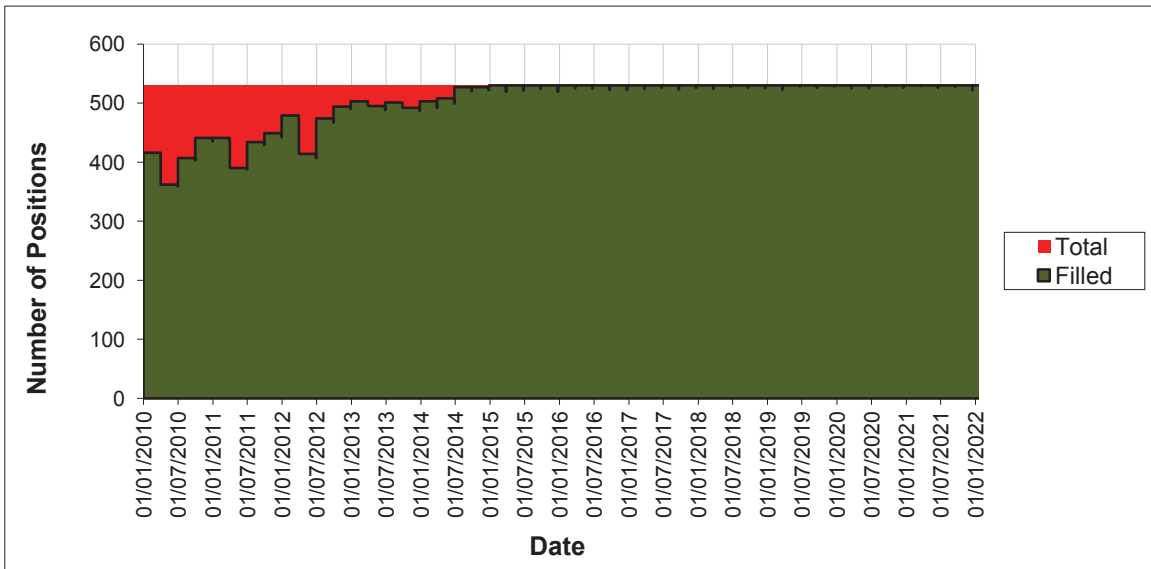


Figure 24: DP1 Positions Filled after proposed changes

3.2.2 Reduced Intake Plan

To determine how much the intake plan should be lowered in the fourth and following years to reduce the number of trained recruits waiting to enter the ACISS structure, the new scenario was run again with the number of new recruits reduced to 320 in the fourth year and then reduced again to 156 for the remaining eight years. Figure 25 shows the difference in trained recruits waiting to enter the ACISS structure between the two intake plans. With the reduced intake plan, virtually all trained recruits were able to enter the structure, and there was no effect on the fill rate of the structure shown in Figure 19. Additional analysis would be required to further optimize these intake proposals; however, this does indicate the magnitude of the required reduction. Such a reduction in the required intake plan will also significantly reduce the training courses required to maintain the ACISS structure when it is in this steady state condition.

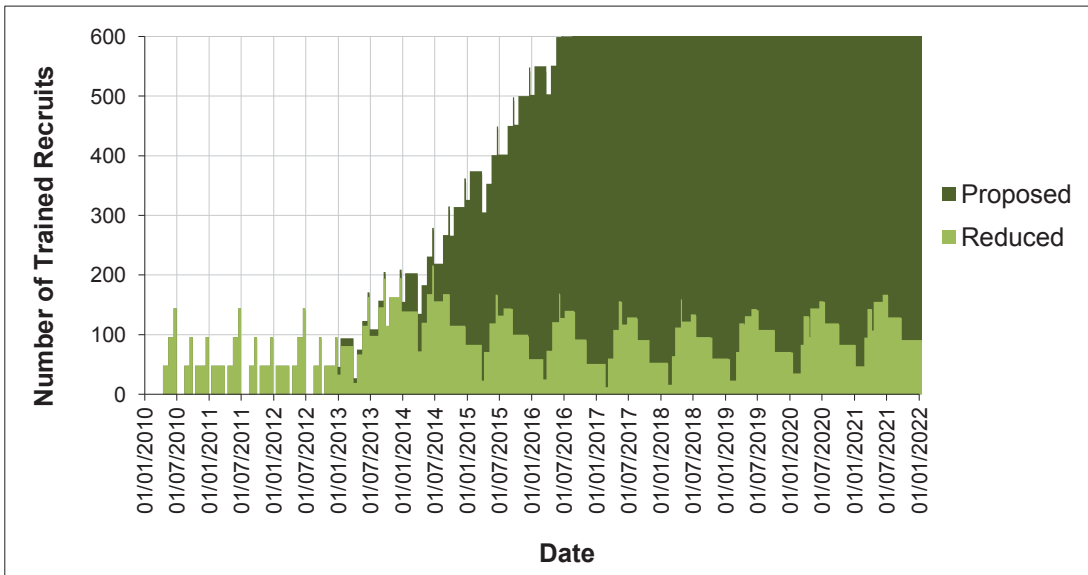


Figure 25: Trained recruits waiting to be placed after proposed changes

4 Conclusions & Recommendations

4.1 Conclusions

The ACISS structure along with a proposed intake and training plan were successfully modelled in MARS for a 12 year period. Preliminary results indicated that it would take approximately nine years to fill most of the vacant positions in the ACISS structure due to bottlenecks in the training system that limited the rate at which members moved between the ranks and DP levels. The effect of these bottlenecks also prevented new recruits from being able to enter the ACISS structure as there were no entry-level positions available at the DP1 level (3799 JobGrp) indicating that the proposed training plan was inadequate to support the proposed intake plan. In addition, the initial assignment of qualifications was based on the minimum requirements for the position and did not necessarily reflect the actual training level of the individuals. This caused a lack of students for the first serials of courses requiring a compulsory qualification and represents a worst case scenario for eligibility for promotion and training.

Proposals to address these bottlenecks and initial assignment of qualifications were then examined by analyzing a second scenario in which the number of students allowed in specific courses was increased and some additional courses were run in the first year to model the effect of the proposed changes. With this adjusted training plan, MARS forecasted that the ACISS structure would be fully manned in approximately five years, and that all new recruits would be able to find positions for the first three years after which the intake plan would exceed the number of unfilled positions plus the expected attrition. The intake plan was then reduced to 320 in the fourth year and reduced again in the fifth and following years to an estimated steady state intake value of 156, which resulted in almost all new recruits being able to find a position in the ACISS structure. The result of the proposed changes was an ACISS structure filled in approximately half the time of the initial training proposal and one that allowed virtually all new recruits to find a position in the ACISS structure. More analysis would be required to determine if the system could be further optimized.

4.2 Recommendations

It is recommended that:

1. The proposed training and/or intake plan be adjusted to reduce or remove the bottlenecks in the promotion system and to ensure new recruits are able to find an entry position in the ACISS structure; If the proposed annual intake of 384 is to be sustained, it is recommended that:
 - a. The capacity of the 5600, 5601, 3801, and 4943 courses required to be transferred from the DP1 to the DP2 level be increased by a factor of 1.5;
 - d. The capacity of the 3950 course be doubled and the 4045 course be increased by a factor of 1.5; and

- e. The intake and training plans be re-evaluated and reduced in the fourth year to prevent new recruits from being unable to enter the ACISS structure and to modify the training course schedule to reflect the reduction in new recruits;
2. Once equivalencies to the previous occupational qualifications have been established, the effect of these equivalent qualifications be addressed and that the proposed training course schedule be modified or additional courses be considered to ensure that eligible students can be found for the first serials of new ACISS courses. This will prevent courses from having to be cancelled during the first year due to a lack of eligible students; and it will reduce the time required for the ACISS structure to be fully manned;
3. Other factors be modelled to determine what effect they will have on the training system and on the overall ACISS structure such as:
 - a. The operational tasks that will place competing demands on the members; and
 - b. The CF leadership courses required for promotion;
4. All of the proposed ACISS courses be modelled to determine their effect on student and instructor availability and potentially determine whether CFSCCE has the capacity to run all of the proposed serials; and
5. The ACISS structure along with the current intake plan, training course schedule, operational tasks, and attrition rates be analyzed using MARS both periodically and whenever changes are proposed to forecast potential issues with the ACISS occupation so that CF management has the opportunity to address the issues in a timely manner with a better understanding of the potential risks.

References

- [1] Okazawa, Stephen, Ormrod, Mike, Young, Chad, *Managed Readiness Simulator (MARS) V2: Design of the Managed Readiness Model*, DRDC CORA TM 2009-057, November 2009.
- [2] Okazawa, Stephen, Ormrod, Mike, Young, Chad, *Managed Readiness Simulator (MARS) V2: Implementation of the Managed Readiness Model*, DRDC CORA TM 2010-261, December 2010.
- [3] Canadian Force Administrative Order (CFAO) 49-4

Annex A Data

A.1 Job Positions Provided by DLCI

Table A1 gives a summary of the job positions provided by DLCI and the Job Groups.

Table A1: Job Positions

Level	JobGrp	Job	Title	Personnel	Positions
DP1	3799	3799	ACISS Det Mbr	135	162
		3959	CommCen Spec	34	53
		4937	NCCIS Spec	19	19
		4944	LOS Comm Sys Spec	26	30
	4052	4052	Tac Line Sys Spec	79	83
	3791	3791	Tac Comm Sys Spec	49	75
		4179	ISR Spec	1	3
		3947	LOS Comm Sys Spec	1	3
		4934	FD Arty Comm Sys Spec	1	1
	3806	Crypto Maint Spec	1	1	
4969	4969	IS Net Spec	70	100	
DP2	4943	4943	Tac Comm Sys Admin	239	318
		4941	C-RCIED Spec (Op)	1	2
		4940	ECM Spec (Op)	1	1
		4935	CommCen FCC Spec	3	4
		4203	Crypto Adm Sys Spec	18	21
		3891	HFGW Comm Sys Spec	15	22
	5601	5601	Tac Line Sys Tech	48	51
		3942	Strat Line Sys Tech	84	88
		3872	Telecomm Sves Tech	21	34
	5600	5600	Tac Comm Sys Tech	98	153
		4051	AD Comm Sys Tech	2	10
		3955	NCCIS Tech	12	15
		3908	Crypto Maint Tech	5	6
		3894	Spec Comm Sys Tech	26	32
		3805	Comm Sys Tech	15	22
	3801	3801	Info Sys Admin Tech	41	61
		4931	IS Net Admin Tech	112	143
		4938	IS Help Desk Tech	36	49

Level	JobGrp	Job	Title	Personnel	Positions	
MCpl	3818	3812	HFGW Comm Sys Det Comd	6	7	
		3818	Tac Comm Sys Det Comd	183	241	
		3839	CommCen Det Comd	21	26	
		3906	Alt COMSEC Cust	30	36	
		4912	NCCIS Det Comd	17	19	
		4922	CommCen FCC Det Comd	5	7	
		4924	ECM Det Comd (Op)	1	2	
		4926	C-RCIED Det Comd	2	5	
		4929	LOS Comm Sys Det Comd	5	7	
		4930	ACISS STMN	13	19	
	4048	3809	Unit Tac Line Det Comd	13	15	
		3863	Telecomm Svcs Det Comd	12	15	
		4048	Tac Line Det Comd	14	18	
		4161	Strat Line Sys Det Comd	37	40	
		5658	RD Line Sys Det Comd	3	4	
	3949	3816	Crypto Tech Det Comd	0	2	
		3819	Comm Sys Tech Det Comd	19	31	
		3827	Spec Sys Tech Det Comd	1	2	
		3948	LOS Tech Det Comd	11	11	
		3949	Tac Comm Sys Tech Det Comd	82	119	
		4206	AD Sys Tech Det Comd	3	6	
		4916	ELINT Trial Tech Det Comd	1	1	
	4911	3902	IS Net Ops Cen Det Comd	8	11	
		4893	Web Developer	3	4	
		4898	IS Help Desk Det Comd	18	24	
		4910	IS Admin Det Comd	30	36	
		4911	IS Net Admin Det Comd	80	103	
		5607	CND Det Comd	10	10	
		5608	NVAT Det Comd	5	5	
	Instr	3794	Instr	48	59	
		3900	Trg Coord	14	18	
	Sgt	3832	3802	COMCEN Sect Comd	6	10
			3811	HFGW Comm Sys Sect Comd	6	6
3832			Tac Comm Sys Admin Sect Comd	76	90	
3836			COMSEC Custodian	11	11	
4047			CIS Resource Sect Comd	1	2	
4072			NCCIS Sect Comd	6	8	

Level	JobGrp	Job	Title	Personnel	Positions
Sgt	4158	3855	Telecomm Svcs Sect Comd	11	15
		4068	Strat Line Sys Sect Comd	36	39
		4158	Tac Line Sys Sect Comd	5	6
		4210	RD Line Sys Sect Comd	4	4
	4019	3912	Comm Sys Tech Sect Comd	14	20
		3952	C2 Net Designer	2	4
		4019	Tac Comm Sys Tech Sect Comd	29	36
		4160	TSIT	4	4
		4914	ELINT Trial Tech Sect Comd	1	1
		4915	NATO Comm Net Tech Sect Comd	1	1
	4967	4133	Net Op Sect Comd	3	4
		4134	IS CIRT Sect Comd	1	1
		4891	Net Ops Center Sect Comd	8	9
		4908	IS Help Desk Sect Comd	8	10
		4967	IS Net Admin Sect Comd	45	51
	Instr	6015	Instr	6	7
		4907	Instr Sect Comd	16	18
		4919	Stds Writer	5	6
		3850	Trg Supr	11	11
		3820	RSSA	13	22
		4889	Ops Sgt	18	18
WO	3789	3789	Ops WO	27	30
		3851	TP Mgr	6	8
		4033	Tp WO	51	61
		4130	RSS	14	21
		4904	Stds Mgr	1	2
		4946	Crse Dir	0	1
	3950	3826	Assist Formn of Sigs	7	8
		3909	Assist Fmn Info Sys Mgr	1	1
		3950	C2 Sys Resource Mgr	31	37
		4049	ITSEC Insp	0	1
		4053	ISSO	3	3
		4056	Tac LCF	4	4
		4162	TSIT Mgr	5	5
		4863	Asst Chief Comm Op	8	9
		4971	LCMM	6	8
5570	Strat LCF	11	11		

Level	JobGrp	Job	Title	Personnel	Positions
MWO	4945	4041	SSM	22	23
		4903	FCA	1	2
		4945	CIS Mgr	2	2
		5569	MES Mgr	1	1
		6016	QS Mgr	10	13
		6017	Career Mgr	1	1
	3871	3871	C2 Sys Planner	22	24
		4049	ITSEC Insp	2	3
		4170	Strat LCS	4	5
		4890	Tac LCS	4	4
		4971	LCMM	17	24
		6018	CCO	17	18
		6020	F of S	11	14
		6022	Fmn LCS	2	2
CWO	ACISS	3796	Army CIST Mgr	0	2
		3804	Start Comd LCS	3	3
		3969	Army Master of Sigs	2	2
		4172	Army LCS	1	1
		4865	RMS	12	12
		4901	COMSEC Insp	1	1
		4902	Senior Career Mgr	1	1
		5566	Army F of S	1	1
		6017	Career Mgr	1	1
		6024	CIS Trg Auth Mgr	1	1
Total				2549	3250

List of symbols/abbreviations/acronyms/initialisms

ACISS	Army Communications and Information Systems Specialist
CF	Canadian Forces
CFAO	Canadian Forces Administrative Order
CFSCE	Canadian Forces School of Communications and Electronics
CISTM	Communication & Information Systems Technology Manager
CORA	Centre for Operational Research and Analysis
Cpl	Corporal
CST	Communication Systems Technologist
CWO	Chief Warrant Officer
DGMPRA	Director General Military Personnel Research and Analysis
DLCI	Director of Land Command and Information
DP	Developmental Period
DRDC	Defence Research & Development Canada
DND	Department of National Defence
GUI	Graphical User Interface
IST	Information Systems Technologist
JobGrp	Job Group
LCIS Tech	Land Communications and Information Systems Technician
LMN	Linemen
LST	Line Systems Technologist
MARS	Managed Readiness Simulator
MCpl	Master Corporal
NCM	Non-Commissioned Members
MWO	Master Warrant Officer
OCDT	Officer Cadet
Pte	Private
PteB	Private Basic
PteT	Private Trained
Quals	Qualifications
R&D	Research & Development

ResGrp	Resource Group
Sgt	Sargeant
Sig Op	Signal Operator
SIP	Strategic Intake Plan
TIR	Time In Rank
WO	Warrant Officer
YOS	Years of Service

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The Army is in the process of restructuring the Signals Non-Commissioned Members occupations to create a new Army Communication & Information Systems Specialist (ACISS) occupation by combining the current Land Communications and Information Systems Technician; Signal Operator; and Linemen occupations. In order to validate the complex ACISS structure concept and to optimize the implementation and sustainment of this new occupation, the Managed Readiness Simulator (MARS) program was used to conduct some population modelling analysis. The ACISS structure along with a proposed intake and training plan were successfully modelled in MARS for a 12 year period. Preliminary results indicated that it would take approximately nine years to fill most of the vacant positions in the ACISS structure due to bottlenecks in the training system indicating that the proposed training plan was inadequate to support the proposed intake plan. Proposals to address these bottlenecks were then examined along with proposed reductions to the intake plan to prevent trained recruits from being unable to find a job in the ACISS structure. The result of the proposed changes was an ACISS structure filled in approximately half the time of the initial training proposal and one that allowed virtually all new recruits to find a position in the ACISS structure. Finally, it was recommended that MARS be run both periodically and whenever changes are proposed to forecast potential issues with the ACISS occupation so that Canadian Forces (CF) management has the opportunity to address the issues in a timely manner with a better understanding of the potential risks.

L'Armée de terre procède actuellement à la restructuration du métier des transmissions des militaires du rang en vue de créer un nouveau groupe professionnel militaire (GPM) de spécialistes des systèmes de communication et d'information de l'Armée de terre (SSCIAT) en combinant les professions actuelles de technicien des systèmes d'information et de communications terrestres, d'opérateur des transmissions et de monteur. Afin de valider le concept complexe de la structure du GPM SSCIAT et d'optimiser la mise en œuvre et le maintien de ce nouveau groupe professionnel, on a utilisé le programme de simulation de la disponibilité opérationnelle (MARS) pour effectuer une analyse de la modélisation des effectifs. À l'aide de ce programme, on a modélisé avec succès la structure du GPM SSCIAT ainsi que les plans de recrutement et d'instruction prévus, pour une période de 12 ans. Les résultats préliminaires indiquent que cela prendrait environ neuf ans pour doter la plupart des postes vacants dans la structure du GPM SSCIAT, compte tenu des goulots d'étranglement dans le système d'instruction montrant que le plan d'instruction proposé était inapproprié pour appuyer le plan de recrutement proposé. On a ensuite examiné les propositions visant à trouver une solution à ces goulots d'étranglement ainsi que les réductions proposées pour le plan de recrutement, afin d'éviter que les recrues nouvellement formées ne soient dans l'impossibilité de trouver un emploi dans la structure du GPM SSCIAT. Les modifications proposées ont permis d'avoir une structure du GPM SSCIAT où les postes seraient comblés dans environ la moitié du temps initialement prévu dans le plan d'instruction, et où presque toutes les nouvelles recrues trouveraient un poste. Enfin, on a recommandé que le programme MARS soit exécuté périodiquement et chaque fois que des modifications sont proposées pour prévoir les questions potentielles relatives au GPM SSCIAT, de façon à que les gestionnaires des FC aient la possibilité de résoudre ces questions en temps opportun et en comprenant bien les risques potentiels.

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.)

MARS; ACISS Occupation; Managed Readiness Simulator; Personnel Modelling; Training Plan; Intake Plan; Army; Forecasting

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