THE ROYAL REGIMENT OF CANADIAN ARTILLERY SCHOOL (RCAS)


ÉCOLE DU RÉGIMENT ROYAL DE L'ARTILLERIE CANADIENNE (ÉARC)

# THE LONG COURSE JOURNAL

# D'ENSEIGNEMENT ÉLANCÉ

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# THE LONG COURSE JOURNAL

# D'ENSEIGNEMENT ÉLANCÉ

# COMMANDER

## *Combat Training Centre*

**Foreword**

As part of Strong, Secure, Engaged, Canada's defence policy, the Canadian Army will continue to maintain a high operational tempo necessitating highly agile, multi-purpose, combat capable forces that can operate within a complex, ever changing operating environment. As such, members of The Royal Regiment of Canadian Artillery (RCA) will need to continue to successfully operate within an environment that is characterized by emerging threats and the rapid evolution of technology.

An adaptable and innovative individual training institution, the Combat Training Centre, including The Royal Regiment of Canadian Artillery School (RCAS), remains committed to leveraging field force operational lessons learned, adopting new teaching techniques, and applying emerging technological advancements and equipment to the manner in which it delivers training. The RCAS continues to be recognized as an organization that is relevant, efficient, and modern, enabling the development of highly qualified RCA leaders and soldiers ready for land operations.

The Combat Training Centre remains committed to individual training excellence, two of the premier courses to set this example are the Instructor-in-Gunnery (IGs) and Assistant Instructor-in-Gunnery (AIG) courses conducted at the RCAS this year. Throughout this year-long programme, select members have received world-class, relevant advanced training allowing them to focus on their Artillery technical and tactical skills, better preparing them for their employment as instructors at the RCAS, while supporting field force operational excellence.

The programme curriculum includes the completion of research and development of an Artillery related article. The Long Course Journal is the collection of these articles written by current IG and AIG students. This portion of the programme has afforded the students the opportunity to focus on specific Artillery topics, resulting in the exchange of professional thoughts and dialogue amongst a wide range of readers across the Canadian Army.

I invite you to review the number of articles presented by these students, which I am convinced will support RCA capability development, individual training and doctrine revitalization initiatives. I also recommend that you seek to discuss these topics throughout your Royal Regiment, enhancing our collective knowledge.

**Colonel J.W. Errington, MSM, CD**
*Commander Combat Training Centre*





# COMMANDANT

## *Centre d'instruction au combat*

**Avant-propos**

La politique de défense du Canada étant Puissante, Sécuritaire et Engageante: l'Armée Canadienne continuera à maintenir un rythme opérationnel élevé qui exige des forces agiles, polyvalentes et aptes au combat qui peuvent fonctionner dans un contexte opérationnel complexe, en changement constant. À ce titre, les membres du Régiment Royal de l'Artillerie Canadienne (ARC) devront continuer de réussir à fonctionner dans un contexte caractérisé par les menaces émergentes et l'évolution rapide de la technologie.

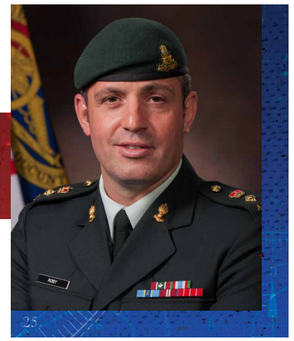
Le Centre d'Instruction au Combat, qui comprend l'École du Régiment Royal de l'Artillerie Canadienne (EARC), est un établissement d'instruction individuelle adaptable et innovateur, qui demeure déterminé à tirer parti des leçons retenues opérationnelles de la force de campagne, à adopter de nouvelles techniques d'enseignement et à mettre en application les nouvelles technologies et équipements de façon à assurer la prestation de la formation. L'EARC continue d'être reconnue comme une organisation pertinente, efficace et moderne, qui permet de perfectionner les leader et soldats du ARC hautement qualifiés qui sont prêts pour les opérations terrestres.

Le Centre d'instruction au Combat, demeure engagé à l'égard de l'ecellence en instruction individuelle; à titre d'exemple, deux des principaux cours sont ceux d'instructeur en artillerie (IA) et d'instructeur adjoint en artillerie (IAA) qui se sont déroulé à l'EARC cette année. Tout au long de ce programme d'un an, ces membres ont reçu une formation avancées pertinents et de niveau international leur permettant de se concentrer sur leurs compétences techniques et tactiques d'artillerie, pour mieux les préparer pour leur emploi en tant qu'instructeurs à l'EARC, tout en soutenant l'excellence opérationnelle de la force de campagne.

Le programme comprend des travaux de recherche et de rédaction d'un article lié à l'artillerie. Le journal d'enseignement élancé est le recueil de ces articles rédigés par les stagiaires IA et IAA. Cette partie du programme a donné aux stagiaires l'occasion de se concentrer sur des sujets particuliers en artillerie, ce qui donne lieu à l'échange d'idées professionnelles et à un dialogue parmi un vaste éventail de lecteurs à l'échelle de l'Armée Canadienne.

Je vous invite à examiner les nombreux articles présentés par ces stagiaires, et je suis convaincu qu'ils appuieront les initiatives de développement des capacités de l'EARC, d'instruction individuelle et de revitalisation de la doctrine. Je vous recommande aussi de chercher à discuter de ces sujets au sein du Régiment Royal, ce qui améliorera nos connaissances collectives.

**Colonel J.W. Errington, MSM, CD**
*Commandant du Centre d'instruction au combat*



# COMMANDANT

*The Royal Regiment of Canadian Artillery School*

*l'École du Régiment royal de l'Artillerie canadienne*

**Foreword**

The Artillery Long Course dates back to the original training of Artillery instructors with A and B Battery graduating in 1872. A technically challenging combat arms trade, Artillery Officers and Senior Non-Commissioned Officers required a full year's length of training in order to execute their Artillery instructional duties. This year's Instructor-in-Gunnery (IG) and Assistant Instructor-in-Gunnery (AIG) students began their training in July 2017, undergoing several instructional assessments and near constant critique with a view of improving their Artillery related technical and tactical aptitudes.

This first edition of The Long Course Journal represents The Royal Regiment of Canadian Artillery School's (RCAS) commitment to training world-class, relevant instructors during the year-long Instructor-in-Gunnery (IG) and Assistant Instructor-in-Gunnery (AIG) programme. The primary aim of the journal is to create a forum for the students to research and investigate selected Artillery matters in preparation for their employment as IGs and AIGs. The articles presented herein display their knowledge, hard work, and commitment to improving Canadian Artillery practices. We invite you to consider the ideas presented by the students and discuss them amongst fellow Gunners with the goal of enriching our overall knowledge.

**Lieutenant-Colonel N.S. Roby**
*Commandant of The Royal Regiment of Canadian Artillery School*

**Avant-propos**

Le journal d'enseignement élancé de l'artillerie remonte à la formation initiale des instructeurs d'artillerie des Batteries A et B qui ont été diplômés en 1872. Ce métier d'armes de combat est techniquement exigeant, et les officiers d'artillerie et sous-officiers supérieurs ont nécessité d'une année complète d'entrainement pour qu'ils puissent exécuter leurs taches d'instructions d'artillerie. Les stagiaires instructeurs en artillerie (IA) et instructeurs adjoints en artillerie (IAA) de cette année ont commencé leur formation en juillet 2017; ils ont subi plusieurs évaluations pédagogiques et une critique quasi constante en vue d'améliorer leurs aptitudes techniques et tactiques liées à l'artillerie.

Cette première édition du journal d'enseignement élancé représente l'engagement de l'École du Régiment Royal de l'Artillerie Canadienne (EARC) lorsqu'il s'agit de former des instructeurs pertinents et de calibre mondial durant le programme d'un an d'instructeur en artillerie (IA) et d'instructeur adjoint en artillerie (IAA). Le but premier du journal est de créer une tribune pour que les stagiaires fassent de la recherche et approfondissent des questions liées à l'artillerie en préparation pour leur emploi comme IA et IAA. Les articles ici présentés témoignent de leurs connaissances, de leur travail acharné et de leur détermination à améliorer les pratiques de l'Artillerie Canadienne. Nous vous invitons à prendre en considération les idées présentées par les stagiaires et à en discuter entre collègues artilleurs dans le but d'enrichir nos connaissances collectives.

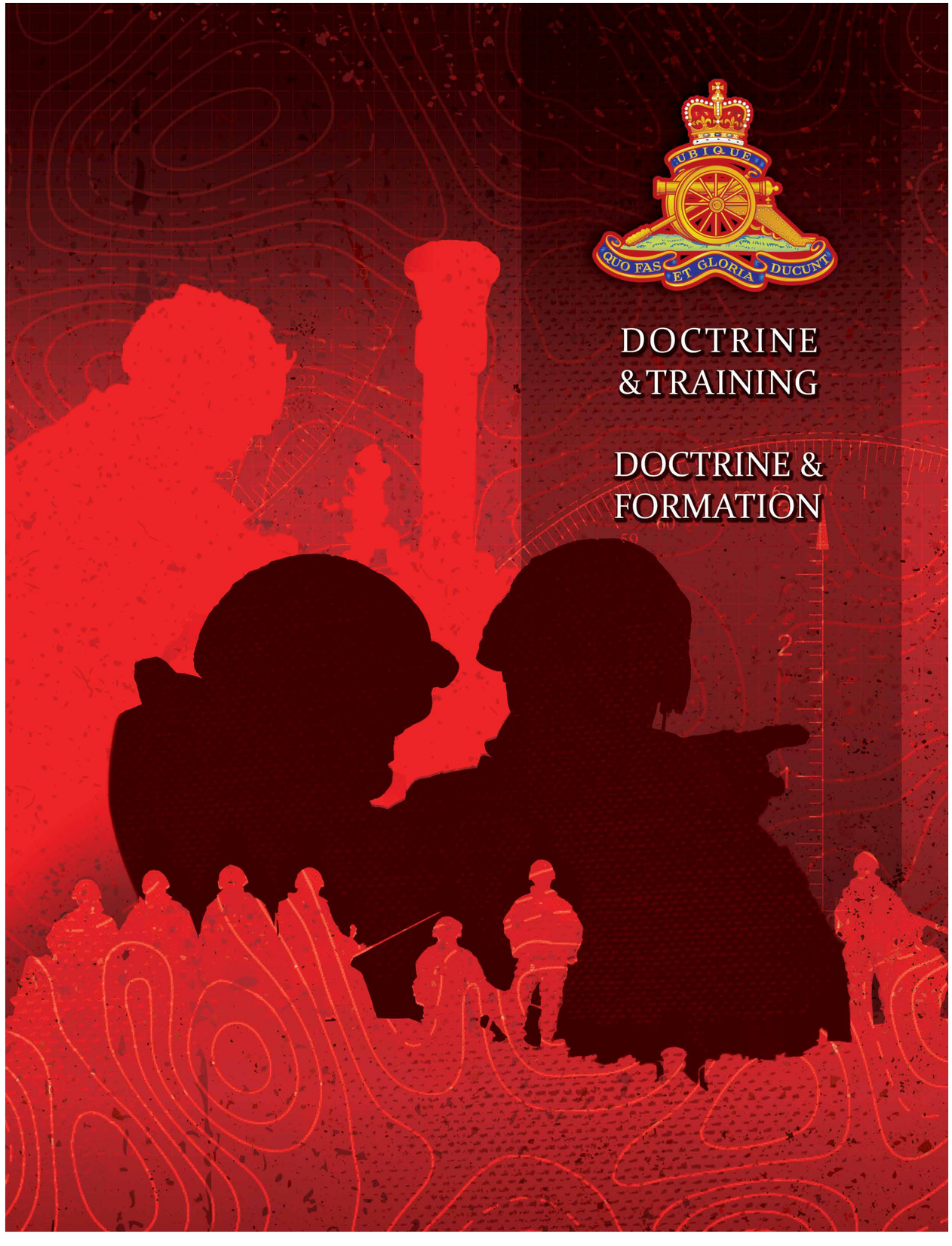
**Lieutenant-Colonel N.S. Roby**
*Commandant de l'École du Régiment royal de l'Artillerie canadienne*





# TABLE OF CONTENTS

*Table des matières*




# DOCTRINE & TRAINING

# DOCTRINE & FORMATION

# LA TRANSITION DE L'ARTILLERIE À L'INFANTERIE POUR LE SERVANT DE MORTIER CONCERNANT LA FORMATION ET LA GÉNÉRATION DES FORCES DES PELOTONS À L'APPUI DES BATAILLONS D'INFANTERIE LÉGÈRE-

CAPT J.M.J.D. DAIGLE ET ADJ M.J.M. BEAUREGARD

AVEC LES CHANGEMENTS GRANDISSANT DE L'ARMÉE CANADIENNE, COMMENT POURRA-T-ON ACHEVER LA TRANSITION DES FORCES LÉGÈRES DANS LES BATAILLONS D'INFANTERIE, EN METTANT L'ACCENT SUR LA TRANSITION DE L'ARTILLERIE À L'INFANTERIE POUR L'UTILISATION DU MORTIER 81MM. CE DOCUMENT CE VEUT NOTRE POINT DE VUE SUR LA FORMATION ET LA GÉNÉRATION DES FORCES DE MORTIERS À L'APPUI DES BATAILLONS D'INFANTERIE LÉGÈRE. NOUS BASONS NOTRE RECHERCHE SUR CE QUI SE PASSE PRÉSENTEMENT DEPUIS QUELQUES MOIS AU CENTRE DE L'EXCELLENCE À LA BFC GAGETOWN. PAR LA SUITE, NOUS OBSERVONS COMMENT LA FORCE DE RÉSERVE PEUT-ELLE, SOUTENIR À LA DEMANDE IMPORTANTE DE SOLDATS AFIN DE COMBLER LES POSITIONS REQUISES AFIN DE CRÉER CES PELOTONS DE MORTIERS. NOUS ALLONS ÉGALEMENT SURVOLER LA FAÇON DONT NOS PAYS ALLIÉS FONCTIONNENT AVEC LA DURE RÉALITÉ DE GÉNÉRER ET D'EMPLOYER CETTE ARME DE TIR INDIRECT EFFICACEMENT.

## Introduction

Au courant des dernières années, l'entrainement des FAC se tourne de plus en plus vers les opérations contemporaines. Ceci est un travail exhaustif puisqu'il requiert que tous les métiers doivent replonger dans leurs livres afin de se familiariser avec leurs doctrines et ainsi, démarquer cette cassure avec les opérations de contre-insurrection dont nous avons fait face. En effet, les dix années de combats en Afghanistan ont quelque peu eu un effet subversif de délaisser le développement des forces légères au profit des groupements tactiques de taille moyenne. Depuis ce temps, la montée fulgurante de la mondialisation et de l'urbanisation force sans contredit les Forces Armées canadiennes à modifier leur façon d'entrevoir l'avenir, soit en développant une force de combat mobile et souple: « Les bataillons d'infanterie légère (BIL) actuels serviront de fondement pour la mise sur pied d'une capacité de Force légère (FL) au sein de l'AC. »[1] N'étant pas le cas actuellement pour les BIL, une des solutions véhiculée par le Commandant de l'Armée Canadienne afin d'améliorer la capacité et la réactivité de notre entité est de réintégrer les pelotons mortiers de 81 mm dans les bataillons d'infanteries légères.

Le but de ce changement est: « produire et de maintenir une puissance de combat sans dépendre des véhicules de combat; d'améliorer la réactivité stratégique et opérationnelle [...] afin d'offrir au Canada une souplesse accrue et des options additionnelles quant à l'utilisation des capacités de l'AC. »[2] Une importante période de réallocation des ressources et d'instruction au BIL sera donc cruciale dans les mois à venir. C'est pourquoi nous allons étudier dans ce document, à savoir comment est-ce que l'AC va pouvoir générer et employer cette force pour employer les mortiers de 81 mm en incluant également la réserve? Nous allons également visualiser les moyens de mettre en œuvre des solutions concernant la transition des troupes à l'appui des bataillons d'infanterie légères. Nous allons dans un premier temps étudier la composition doctrinale d'un peloton de mortier d'infanterie et du nombre de personnel requis, des solutions probables quant à l'utilisation et comment générer ces forces et finalement, de jeter un coup d'œil aux pays alliés quant à leur propre utilisation des mortiers dans les BIL.

## Méthode/Approche

Pour ce faire, nous nous sommes concentrés plus exactement sur le travail qui a déjà été mis en branle pendant plusieurs mois, afin de mettre en place dans l'ensemble un plan d'entraînement compatible à celui déjà en place. Notre approche consistait à vérifier les changements qui devront être apportés, en travaillant étroitement avec la cellule d'infanterie de l'école à Gagetown. Plusieurs de nos sources proviennent de documents créés suite à des groupes de travail et selon des publications autrefois utilisées dans le passé lorsque les mortiers 81 mm étaient déjà incorporés dans les BIL.







## Examen de la documentation/ Sources

Pour faire une mise en contexte, l'AC est présentement en train de mettre sur pied une réadaptation de ses bataillons d'infanteries légères afin de les rendre plus indépendants comme ils étaient autrefois, intégrant à la fois les pelotons antichars, les pionniers ainsi que les pelotons de mortiers 81 mm. À quoi peut donc ressembler la composition d'un peloton de mortier?

En premier lieu, il serait composé d'un commandant de section, incluant un officier junior ainsi que 2 chauffeurs/signaleurs. Puis un détachement pouvant mettre en place le Poste de Commandement, avec un officier junior, un officier non-commissionné comme responsable du poste de commandement (PC) ainsi que 3 techniciens/signaleurs. Va par la suite le détachement de support, composé d'un adjudant ainsi que 3 chauffeurs-responsables de la munition. Finalement, nous avons le groupe en tant que tel de mortier, soit 4 détachements, incluant 4 tubes. Chaque détachement aura pour tâche de regrouper 3 servants par tubes, additionnant l'officier de PC, le Sergent-major de troupe et finalement, le contrôleur des feux de mortiers et son détachement (voir annexe 1). Au total, c'est 16 membres qui totaliseront une troupe de mortier sur le champ de bataille. La composition totale d'un peloton sera environ de 41 membres.

D'où ces membres proviendront-ils? Tout d'abord, au moment d'écrire ces lignes, l'École d'Artillerie Royale Canadienne travaille conjointement afin de mener à terme la transition du système d'arme vers l'école d'infanterie. De fait, depuis près de 2 années, la cellule de mortiers à l'école d'infanterie travaille afin de mettre à jour la publication[3], autrefois utilisée pour la formation des équipes de mortiers. À ce jour, la réforme de ce document se porte bien afin d'être envoyé au Ministère de la Défense Nationale et ainsi être publié et officialisée pour l'entrainement actuel. C'est d'ailleurs une coopération étroite entre la cellule d'artillerie et celle d'infanterie qui aura permis une transition rapide et efficace.

Présentement, des cours de servants de mortiers sont mis en place afin de qualifier un bon nombre de soldats pour le cours dit, de base. Le but de la cellule d'entrainement est de créer 3 cours distincts afin de mettre sur pieds des troupes de mortiers adéquates pour les bataillons. Le premier, comme mentionné ci-haut est celui de base. Ce cours se veut principalement être le cours de servant de mortier comme employé dans l'artillerie. Puisque tout est déjà bien établi dans les publications d'artillerie, ce cours ne demande pas un trop gros effort logistique et a pour but de qualifier un bon nombre de soldats. En effet, une solution bien simple est que les Régiments d'artillerie peuvent facilement intégrer des fantassins lors de leurs formations pour créer des servants de mortiers 81 mm. La finalité de ce cours repose sur la formation de soldats sur la discipline de tir, connaitre et manipuler la munition, compléter l'inscription des tubes et de répondre aux demandes de tir. Néanmoins, se voulant être à la fois autonome et capable d'acquérir sa propre identité, le corps d'infanterie voudra se séparer du lourd cadre où l'artillerie se vautrait depuis des années avec le 81 mm. Voulant délaisser le trop-plein de procédures non indispensables pour les tâches de l'infanterie, les cours plus techniques seront séparés en deux entités. C'est d'ailleurs le plus lourd fardeau que les dirigeants font face en ce moment : comment peut-on toujours s'entrainer de manière sécuritaire, tout en modernisant la façon dont le mortier sera employé sur le champ de bataille?

Suite au cours de base il y aura un besoin important à qualifier les membres sur la lunette panoramique et également former des responsables de la ligne de tir (Line NCO), un cours de mortier intermédiaire suivra celui de base pour ces tâches. Les procédures d'inscriptions resteront cependant les mêmes, cependant puisqu'il n'y a pas de Commandant de détachement comme avec l'artillerie (No 1), la seule différence résidera dans le grade de la personne qualifiée pour le faire. Outre les postes mentionnés ci-haut, le cours intermédiaire aura pour tâches de qualifier également les équipes de poste de commandement. Sans se leurrer, le poste de commandement n'aura aucune ressemblance à celui que l'artillerie connaît, mais sera néanmoins équipé du logiciel ordinateur de contrôle de tir indirect (LOCTI). L'objectif dans la mire serait à partir de 2018. Finalement, afin de qualifier leurs propres observateurs, soit les contrôleurs de feux de mortiers, un cours avancé sera mis en branle afin de compléter une troupe de mortier. Ce contrôleur permettra aux bataillons légers d'opérer sans avoir besoin d'avoir un officier d'observation avancé, à partir de 2020. Ce cours avancé aura également pour tâche de remplir les besoins au niveau du centre de contrôle des feux d'appui. Bien évidemment, ces deux derniers cours sont encore en développement, puisque l'effort principal demeure encore les cours de bases de servants de mortiers.

## Discussion

Comment pourrons-nous dans le futur atteindre une interopérabilité avec le corps d'infanteries, puisque les qualifications ne seront pas les mêmes pour les deux entités? C'est sur cette question que le Régiment Royale devra se pencher dans les prochains mois. De notre côté, nous préconisons le fait que l'Artillerie Royale canadienne devrait se moderniser afin d'adopter la nouvelle façon de faire de l'infanterie, et ainsi d'être à jour et être en mesure

d'atteindre une interopérabilité similaire entre les deux entités distinctes. Le fait de séparer les deux cours plus avancés ferait en sorte que le niveau de difficulté serait beaucoup moins haut prenant en compte le niveau de nouvelles connaissances à apprendre en peu de temps «Le saut d'un cours de servant de mortier de base à un cours avancé est phénoménal, ce qui explique le haut taux d'échecs du cours avancé. »[4] Ceci s'explique par le fait qu'il n'existe aucune progression logique entre le haut niveau de connaissance entre les deux cours, donc ce qui justifie pleinement la séparation entre un cours intermédiaire et avancé.

Comment peut-on faire en sorte que les BIL puissent être en mesure de fournir autant de nouveaux membres afin d'être autosuffisant dans les prochaines années? Il faut prendre en compte que ce processus sera étalonné sur plusieurs années. Est-ce que la réserve peut aider? Certainement, le meilleur emploi de la réserve dans ce scénario selon nous n'est pas d'utiliser complètement des membres de la réserve afin de combler des détachements de mortier au complet. À cause de la difficulté et à la complexité des cours, les postes clés au niveau de la troupe devraient être confiés à des réguliers, pour la simple et bonne raison que nous devons nous assurer de la disponibilité de ces membres qualifiés. Trop souvent il est impossible de miser sur une participation sûre et certaine provenant des unités de réserve, puisqu'ils sont par définition trop souvent des membres à temps partiel. La solution réside probablement de fournir des contrats à temps plein, aux membres de la réserve pour remplir les postes de servants de mortiers de base, ce que nous pouvons trouver majoritairement dans les unités de réserve d'artillerie partout au Canada. Le défi le plus grand auquel nous pouvons nous confronter, résidera dans la formation du personnel du côté leadership. C'est pourquoi dans les premières années, examiner la possibilité d'utiliser les membres déjà qualifiés dans les Régiments d'artillerie au Canada devrait être considéré.[5]

Comment les autres nations dirigent-elles leurs entrainements? Du côté des Australiens, leurs entrainements est divisé en deux, soit les qualifications de mortier de base et celle de *Line NCO et* d'officier. Néanmoins, les soldats demeurent entraînés sur les tubes, afin de conserver une banque de membres qualifiés pour du renforcement: « Les membres du peloton doivent être entrainés afin de remplir leur prochain emploi sénior, et les fantassins sélectionnés devraient être entrainés sur les bases du mortier, et ainsi, être en mesure d'être disponible pour comme renforcement ».6 De plus, les Australiens proclament un entraînement progressif, en séparant la ligne de mortier, le PC et le PO. Cependant, aussitôt qu'ils ont terminé leurs entrainements individuels, ils s'entraineront tout de suite en section et en peloton. L'armée australienne depuis 2011 travaille d'arrache-pied afin d'augmenter les groupes de combat avec des réservistes avec des cycles d'entrainement de 3 ans : « Les demandes envers la réserve sont clairement définies. La réserve doit se tenir debout et doit être prête à être déployée militairement chaque année, afin de renforcer les groupes de combat. »[7]

Par ailleurs, avec cette réalité, l'Armée britannique tente du même coup de moderniser sa puissance de feu avec la restructuration de leur Armée avec: *Army 2020*. En effet, le but est de réduire le nombre de réguliers et d'augmenter le nombre de réservistes afin de combler les pertes. Un pilote d'intégration a d'ailleurs été mis en place, incluant de nombreux exercices réels dans les Plaines de Salisbury et a Warcop, créant un 3e peloton de réservistes afin d'être déployé à BATUK au Kenya à partir de 2017. Toutefois, une dure réalité frappe toujours : « Les réservistes avaient de la difficulté à se présenter à tous les exercices et événements, et il était difficile, voire impossible d'avoir tout le monde présent au même endroit pour participer à des exercices réels à Warcop.»[8] Après leur déploiement au Kenya, force est de constater que les réservistes, avec moins de temps d'entrainement que les réguliers, n'avaient pas tous les qualifications requises afin de manier différents systèmes d'armes, pour cause de temps limité, créant ainsi une armée à deux vitesses. Au final, l'Armée britannique fait face aux mêmes problèmes que nous, soit la formation d'hommes qualifiés pour former des groupes de combat opérationnels. Ils sont tous d'accord qu'il faut mettre les bouchées doubles et faire en sorte de ressortir le plus possible ce qui peut provenir de la réserve, afin de créer une force homogène et rapide.

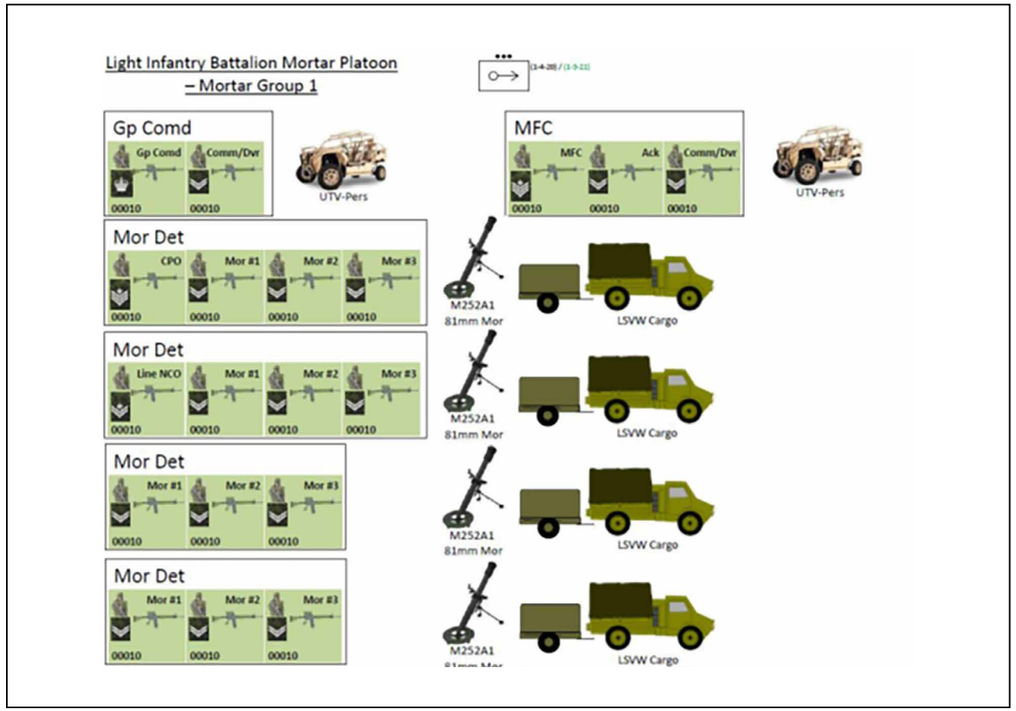
Au Canada, le pas est déjà emboité. Depuis la directive de l'Armée canadienne, les réservistes du Royal New-Brunswick Regiment sont déjà en train de s'entrainer à manier le mortier de 81 mm. Cette initiative existe afin de pouvoir assister les forces régulières dans en entraînement. Autrefois, les réservistes augmentaient les réguliers plus souvent dans des opérations de paix. Sous la nouvelle directive de l'Armée, l'objectif des réservistes amène des habiletés spécifiques afin de venir en aide aux unités : « Pour les opérations outremer, la manière dont l'Armée voit ces pelotons être employés est directement attaché à l'infanterie légère ou aux bataillons mécanisés en opération.»[9] On parle ainsi des soldats qui s'entrainent à Edmundston, Grand-Sault, Saint-Jean et Fredericton. Depuis septembre 2017, l'effort est constant au Canada afin de recruter le plus grand nombre possible de soldats entre 18 et 55 ans.

## Conclusion

Nous croyons que pour l'instant, les Forces Armées Canadiennes vont toujours dans la bonne voie. La collaboration entre l'école d'Artillerie et d'Infanterie est excellente afin de fournir l'instruction la plus adéquate afin que la transition pour les membres de l'infanterie soit la plus facile possible. Nous croyons fortement que les cours devraient être stratifiés, afin de miser sur les qualifications de bases et cibler les bonnes personnes afin de former les postes plus techniques. Nous sommes persuadés que pour être en mesure de générer un bon nombre de personnel qualifié, il sera indispensable de se pencher vers la réserve, cependant, il faudra faire attention de s'assurer de ne pas manquer le bateau quant à la disponibilité de ces membres envers les postes clés. Pour ce qui est de l'artillerie, nous souhaitons fortement qu'elle puisse se moderniser afin d'adopter une marche à suivre qui ressemblera plus à l'infanterie pour l'utilisation des mortiers de 81 mm. Beaucoup de leçons peuvent être apprises des deux côtés. De plus, il serait plutôt sage de garder une capacité de mortiers au sein des écoles d'artillerie et également dans les Régiments partout au Canada. Il serait fou de se départir d'une opportunité d'entrainement avec de la munition aussi accessible que celle de 81 mm pour nos membres.








**Annexe 1** B-GL-392-006/FP-001- Mortar in battle (Draft)

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# LES OFFICIERS JUNIORS ET LA CONDUITE DE LA GUERRE. LE PROBLÈME DE LA PYRAMIDE INVERSÉE.

## *l'emploi des officiers juniors dans le Régiment de l'Artillerie Royale canadienne*

CAPT J.F.C.E.O. LAROCHELLE-LALONDE

LES OFFICIERS JUNIORS SONT FORMÉS DANS LES CENTRES D'INSTRUCTION ET PAR LEUR UNITÉ, MAIS REÇOIVENT-ILS L'EXPÉRIENCE NÉCESSAIRE À LA CONDUITE DES OPÉRATIONS D'AUJOURD'HUI? NOUS REGARDERONS CE QUE LES JEUNES OFFICIERS ONT À DIRE, ET NOUS EXPLORERONT LE PROBLÈME AUQUEL LES UNITÉS FONT FACE, SOIT L'UTILISATION DE LEURS OFFICIERS JUNIORS EN TANT QU'OFFICIER OBSERVATEUR AVANCÉ (OOA).

**Introduction**

Pour mon article, je devais adresser la question suivante : Les officiers juniors reçoivent-ils l'expérience nécessaire à la conduite de la guerre par leur unité? Décrire le problème de la pyramide inversée quant aux positions d'OOA des unités. Une étude pourrait être faite sur les officiers juniors au niveau du Régiment. Cette question est très pertinente d'autant plus que l'armée fait face à de plus en plus de déploiements. La période de la guerre en Afghanistan terminée, les régiments ont dû s'adapter au retour à la guerre conventionnelle et un ennemi de force égale ou quasi égale. Depuis mon arrivée au régiment en 2014, l'entrainement était déjà en changement, retournant vers un entrainement portant l'emphase sur des tactiques de guerre conventionnelle, des caches et des refuges. Cependant malgré un retour aux sources la question reste pertinente, est ce que les officiers juniors ont assez d'entrainement pour la conduite de la guerre. Pour y répondre, j'ai émis l'hypothèse suivante : Non les officiers juniors ne reçoivent pas l'expérience nécessaire à la conduite de la guerre, leur entrainement individuel et collectif ne les préparent pas assez à l'environnement contemporain. Pour y répondre, j'ai fait une étude avec mes collègues officiers.

**Methodologie**

Pour l'étude, j'ai fait un sondage que j'ai distribué aux officiers présents dans l'école, soit ceux du cours d'Officier des Operations d'Artillerie, des candidats sur le cours d'IG et IG dans la batterie (bie) 67. Mon but dans cet échantillon était d'avoir des officiers issus de tous les régiments d'artillerie de la force régulière à travers le Canada, ces officiers étant OOA, SOA (4 SG, ou de bie SAO des régiments de SD). Le questionnaire était simple : une première question afin de déterminer si le répondeur était OOA ou surveillance et acquisition d'objectif (SAO), puis quatre questions, trois questions fermées et une ouverte. Le sondage étant anonyme j'ai pu assumer l'honnêteté de leur réponse puisqu'il n'y aurait aucune répercussion sur leurs réponses. L'échantillon était constitué d'un total de 25 répondants tous des capitaines avec de l'expérience dans un régiment en tant qu'officier junior. Les répondants pouvaient répondre aux questions par des choix préétablis, puis je leurs ai attribué un score de 0 à 8 points comme suit :

- Très en accord (8)
- En accord (6)
- Ni en accord ni en désaccord (4)
- En désaccord (2)
- Fortement en désaccord (0)

Ayant trois questions, chacune la moyenne du score accumulé pour un score de huit le plus fort et zéro le plus bas. Puis la dernière question, une question ouverte afin de déterminer s'il y avait des similitudes dans les commentaires sur les suggestions d'entrainement qui pourraient être bénéfiques. Dans l'étude, les résultats ont été calculés de trois façons, premièrement d'une façon générale ou tous les résultats ont été compilés ensembles, puis d'un côté pour les SOA et l'autre pour les OOA. Cela me permettant de voir s'il y avait une corrélation entre les différents emplois au sein de l'artillerie.

**Résultats de l'étude**

Pour la première question, Mon régiment m'a donné assez d'expérience pour conduire des opérations de guerre, par exemple déploiement ou exercices majeurs (Maple Resolve).

La moyenne générale était de 5,12 soit entre neutre et en accord, la moyenne pour les OOA étant exactement la même alors que 5,75 pour les SOA, très proche de favorable.

Pour la deuxième question, Mon régiment m'a donné assez d'entrainement individuel pour être efficace dans mon travail, la moyenne générale était de 5,28 soit entre neutre et en accord, pour les OOA la moyenne était de 5,5 et les SOA 6.

Pour la troisième question, Mon régiment m'a donné assez d'entrainement collectif pour être efficace dans mon travail, la moyenne générale était de 5,52 soit entre neutre et en accord, la moyenne pour les OOA étant de 5,25 et 6,25 pour les SOA, soit entre en accord et très en accord.

Dans l'étude, il y avait 16 OOA et 9 SAO.

On remarque que les résultats des SAO sont en général plus hauts que ceux des OOA, il y a plusieurs spéculations sur le pourquoi, avec mon expérience personnelle en tant qu'OOA je peux penser à quelques raisons qui l'expliquent, mais en général les résultats ne divergent pas tant. Dans la quatrième question, soit quel type d'entrainement serait bénéfique pour les officiers juniors au régiment, les réponses variaient, mais quelques-unes revenaient souvent, soit l'entrainement avec les autres armes de manœuvre, ou ne pas s'entrainer dans l'isolement (10), soit plus du tiers des répondants suggèrent un entrainement combiné avec les autres armes. En effet, en tant qu'OOA la difficulté du travail n'est pas d'engager un objectif à partir d'un poste d'observation et d'engager une cible dans un secteur d'impact, n'importe quel NCM qualifié membre de det au PO peut le faire. Le plus difficile est d'aviser un cmdt de cie en coordonnant l'appui feu avec son plan de manœuvre. Souvent les jeunes OOA l'apprennent à leur dépendant lors d'exercices majeurs où l'emphase est portée sur la manœuvre comme MAPLE RESOLVE ou la courbe d'apprentissage est très élevée et la crédibilité de l'artillerie tient entre les mains du jeune officier nouvellement qualifié.

Quant à la doctrine de l'infanterie utilisée aujourd'hui, soit l'équipe de combat en opération et le groupement tactique en opération, ce ne sont pas toute les bases qui bénéficient d'un bataillon complet (Shilo) cependant tous les bataillons conduisent des exercices au niveau de cie ou groupe cie, ou l'officier junior (l'OOA) est utilisé. Il serait donc bénéfique d'intégrer ces OOA aux cie le plus possible afin de leur donner la connaissance nécessaire pour agir en tant qu'aviseur. De plus, cela améliorait leur jugement et leur expérience quant à l'utilisation d'artillerie dans différentes situations. Une autre valeur ajoutée serait la compréhension des armes de manœuvre quant au potentiel et aux difficultés de l'artillerie dans toutes les situations possibles qu'un groupement tactique ou une équipe de combat peuvent avoir dans les différents spectres des conflits. Mon Hypothèse a donc été prouvée fausse par l'étude faite et les officiers reçoivent l'entrainement individuel et collectif nécessaire pour les déploiements.

Ceci nous amène à l'utilisation des officiers dans un régiment d'artillerie et la pyramide inversée. Nous allons nous concentrer sur les régiments de support direct soit le 1 RCHA, 2 RCHA et 5 RALC. Dans la progression normale d'un officier, lorsqu'il finit ses phases d'entrainement initiales, il agira comme commandant de troupe dans une bie de canon, puis après environ deux ans ira sur son PP2 OOA ou officier SAO et alors ils ira dans une bie d'OOA ou dans une bie SAO. Selon la transformation de l'artillerie[1] il devrait y avoir neuf détachements d'OOA (force régulière) et trois détachements de JTAC pour un total de 12 capt. Cela créer une situation ou les officiers qui ont acquis une certaine expérience quittent les bies de canon pour aller dans la bie d'OOA ou la bie de SAO. Il faut donc un flot constant d'officiers qui entrent au régiment afin de combler toutes ces positions, il faut donc plus d'officier avec leur PP2 que d'officier entrant au régiment avec leur PP1. Lorsqu'on regarde l'organisation d'une bie[2] on peut voir qu'il faut d'une façon optimale sept officiers juniors pour combler tous les postes nécessaires d'une bie de canon. Et une bie d'OOA 13 officiers juniors[3]. Un régiment de support direct doit avoir 49 officiers incluant l'état-major, donc 43 officiers juniors. Cependant selon les chiffres de cette année, le année-personne (AP) sont 35, 38, et 35 pour le 1 RCHA, 5 RALC et 2 RCHA[4] respectivement ce qui créer un creux de 12 officiers entre le PY actuel et le PY de la transformation d'artillerie.

Le problème que les régiments éprouvent en ce moment est le manque en personnel qualifié présent à l'unité pour les tâches à accomplir en particulier les OOA qui sont le lien entre l'artillerie et la manœuvre. Avec un cours d'OOA par année où environ 4 officiers par régiment sont envoyés pour un maximum de 12 candidats par cours. Et les régiments mutent environ 3 à 4 officiers par année, par exemple en 2016 le 5 RALC à muté deux officiers (OOA), un SAO et un OOA à quitter les forces pour un total de quatre. Ce qui signifie que le régiment a gagné un OOA dans l'année. Quelles solutions pouvons-nous envisager face à cette situation? La réponse n'est pas simple car entrainer un officier en tant qu'OOA prend du temps, il doit faire son PP1 puis son cours d'OOA PP2. Un officier ira sur son cours d'OOA à sa troisième année au régiment des fois deux. À court terme il n'y a pas de solution facile, augmenter le nombre d'officiers entrant met une pression sur les ressources de l'école et le problème n'est pas dans les officiers en attente de formation d'artillerie mais bien le manque d'officier entrant dans l'artillerie en général[5], depuis 2013 nous avons raté notre cible de recrutement d'environ 30% par année à l'exception de 2016-2017 qui l'a manqué de peu. La situation des officiers juniors dans les régiments, en particulier les OOA est assez difficile ces temps-ci en plus des divers déploiements et des tâches nationales ou de brigade ils doivent

aussi trouver le temps d'entrainer leur détachement et de mentorer les officiers plus juniors.

Quels sont les solutions qui s'offrent au Régiment afin de maximiser l'emploi de son personnel et de ses officiers? Une réévaluation du PY des unités est peut être nécessaire afin d'optimiser l'emploi des officiers à travers le corps. Il est tres peu probable que le la quantité de personnel autorisée par l'Armée pour l'artillerie change mais si les FAC continue sur un tempo élevé avec plusieurs déploiements à travers le monde, il faudra trouver une façon d'augmenter le nombre de dét dOOA présentement disponible dans les régiments peut être en diminuant la quantité de personnel dans les centres d'instructions et en exportant d'avantage de cours vers les unités leur permettant de s'entrainer tout en formant du personnel sur les cours nationaux. Cela dit il est évident que présentement le PY de la transformation de l'artillerie ne reflète pas le PY véritable dans les unités et quelque chose doit être fait afin d'alléger la quantité de tâches sur le personnel présentement disponible.

En conclusion, Depuis que l'artillerie s'est transformée, il y a eu des changement majeurs au sein des unités opérationnelles le changement de trois batteries de cannons à deux et la création d'une batterie d'OOA a changé la disposition du personnel dans son organisation la plan pour la transformation semblait efficace sur papier mais le manque de personnel en particulier dans les officiers juniors à surutiliser les OOA disponibles et pourtant selon la transformation il aurait dû y avoir plus d'OOA que de tâches. Cela dit, il semble que les unités font un bon travail dans la formation de leurs officiers et que les régiments les préparent assez bien pour les déploiements tant collectivement qu'individuellement. Le seul manque reste l'intégration de l'artillerie en tant qu'arme de support au combat avec les armes de manœuvres autres que les entrainements de niveau cinq pour les montées en puissances. Il semble donc que les unités réussissent à former leurs officiers et à combler les manques en personnel efficacement.

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[2] Arty transformation
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[5] Recruiting







# ALLIED PUBLICATIONS FOR DIGITAL FIRES

CAPT C.R. LEWINGTON AND WO J.A.W. KAUS

THE FOLLOWING ARTICLE IS A REVIEW OF THE CURRENT STATE OF DOCUMENTATION REGARDING DIGITAL FIRES. THIS REVIEW WILL BE RESTRICTED TO ABCANZ AND NATO RELATED DOCUMENTS AND WILL INCLUDE AN OVERVIEW OF THE KEY DOCUMENTS RELATED TO DIGITAL FIRES, SPECIFICALLY ANY DEFICIENCIES RELATED TO ABCANZ AND NATO DIGITAL FIRES WILL BE HIGHLIGHTED.

### Introduction

The Canadian soldier can expect to deploy around the world in support of major operations, in a multinational context. These forces are increasingly reliant on networks, and supported by sensors, fire support and command and control systems[1]. One of the greatest challenges facing digital networks in a multinational context is the ability to inform and support commanders rather than overwhelm and paralyze.

Interoperability is defined as "the ability to act together coherently, effectively, and efficiently to achieve (Allied) tactical, operational and strategic objectives"[2]. Interoperability across nations, cultures and languages present a greatly elevated risk for fratricide and result in a slower response to calls for fires. The use of voice procedure and manual processes within a multinational context in terms of fires battle management, command, control, communications, computer and intelligence systems (BMC4I) has been found to challenge mission success.[3] The ability to digitally transmit data can eliminate or reduce these risks, greatly improving the Canadian Army (CA) interoperability.

Digital Fires (DF) can be described as a 'system of systems', an automated machine to machine transfer of information that enhances the fires process, reduces fratricide and increases lethality due to the speed and accuracy of the digital transmission. DF needs to encompass a Fires COP (common operating picture), and a Fires Command and Control (C2) capability, which is able to exchange information with partnered nations[4].

In order to ensure that allied militaries are interoperable within a digitalized world it is essential that there be a common knowledge and understanding of the processes and application of digital fires. The need to provide interoperability is being worked on by many collaborative programmes and initiatives, in order to develop and maintain this capability the Canadian Armed Forces (CAF) and the Canadian Army (CA) must prioritize our engagement in order to receive the greatest benefit[5]. This journal will provide a summary of allied (NATO and ABCANZ) digital fires documents. These documents will be reviewed in order of their priority to the Canadian Army (CA) and organized by operational function.

### Review of ABCANZ Documentation

The CA recognizes interoperability with American, British, Canadian, Australian and New Zealand (ABCANZ Program) armies as our main effort for land operations interoperability. The ABCA program is an organization of allied armies that work together to optimize multinational interoperability. ABCANZ operates as a coalition in pursuit of common objectives, and specific objectives and unlike NATO is not an alliance. As the ABCANZ Armies program is a product orientated organization with strong historical and cultural affiliations it is more efficient and effective at developing MN interoperability than NATO.[6] ABCANZ products are generally written with an intended release to NATO and therefore tend to have similar source references and limited overlap or redundancy with NATO products.

The ABCANZ program identified the requirement to plan and execute multinational digital joint fires and air defence operations, and as a result prepared several reports and standards. The primary documents related to digital fires are ABCANZ Report 303 - Technical Statement of Requirement (TSOR) – Digital Fire Support System and Technical Standard Number 2124 – Digital Fire Support System. Together these two documents serve as the primary source documents for ABCANZ nations relating to digital fires.

ABCANZ Report 303 – TSOR Digital Fires Support System contains the user requirements that articulate the outcomes required to be delivered by

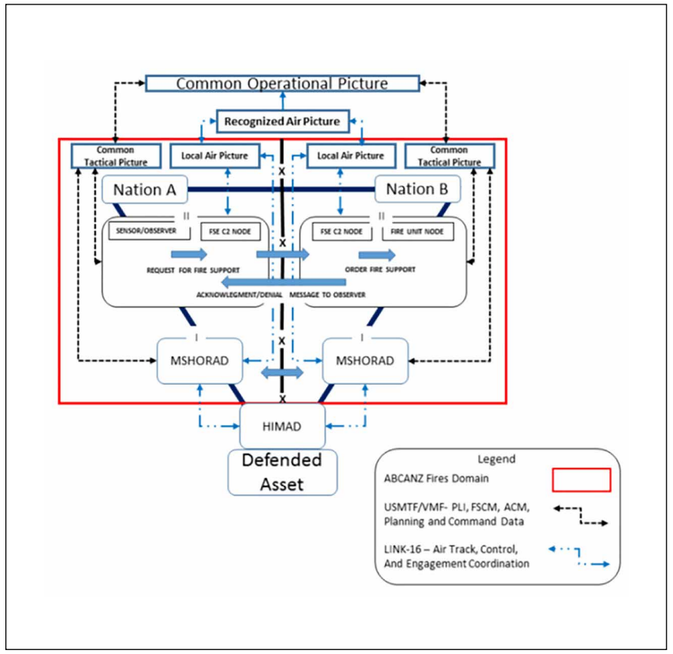


**Figure 1:** ABCANZ Standard 2124 - System Boundary

the Digital Fire Support System. This documents serves to provide focus for ABCANZ nations on the need to plan and execute MN digital joint fires. The ABCANZ program developed the TSOR to leverage the BMC4I systems to provide high fidelity, timely, integrated joint fire support and AMD operations across the multinational level.

The digital fire support system will push and pull information from the Common Operational Picture, providing graphical fire support co-ordination measures, unit and sub-unit locations, target data, and track data. The digital fire support system will utilize tactical radio capabilities below BG level.

The ABCANZ Executive Council has stated the aim of the digital fire support system is to provide integrated interoperability. As the ABCANZ nations develop their digital fire support systems on different timelines it has been acknowledged that compatible and deconflicted systems will exist until such time as all ABCANZ nations implement the TSOR. Integrated level of interoperability has been assessed as being achievable by 2026-2027, given the forecasted acquisition projects and current in service equipment.

In order to understand the digital fire support system, it is critical that one understands the operational context in which it will operate. ABCANZ nations can be expected to contribute force elements to a multinational force under the command of an ABCANZ-led multinational headquarters. This will include units task-organized into echelons below Brigade level, not necessarily organized along national chains of command.

The digital fire support system was developed to support the ground force commander utilizing both close and deep fire support, counter-fires and contribute to suppression of enemy air defenses (SEAD). The system will provide both guided and unguided munitions and contain a wide array of elements to include the following;

- Surveillance Target Acquisition systems linked to the wider ISTAR network,
- BMC4I which provides a C2 network which enables commanders of fire support and air defense systems to integrate fires and effects across all domains,
- A wide variety of delivery platforms, including guided and unguided kinetic and non-kinetic fires,
- An automated, digitally integrated ammunition system,
- An automated planning capability that supports and disseminates the plan.

The digital fire support system must be capable of supporting the concept of operations and intent of the ground force commander including the following tasks;

- Digital interoperability across all ABCANZ BMC4I systems,
- Dynamically allocating available fires assets,
- The ability to synchronize STA systems with the ISTAR network,
- Facilitate the targeting/engagement process,
- Integration of fire support and effects,
- Digital C2 of all fires systems,
- Coordination of the joint fire support effects,
- Planned and dynamic coordination, de-confliction and integration of fires within the operational airspace environment,
- Enable liaison and cooperation across service, branches and combined forces, and
- Enable fire support ammunition related combat service and support.

ABCANZ Standard 2124 builds upon the requirements detailed in ANCANZ





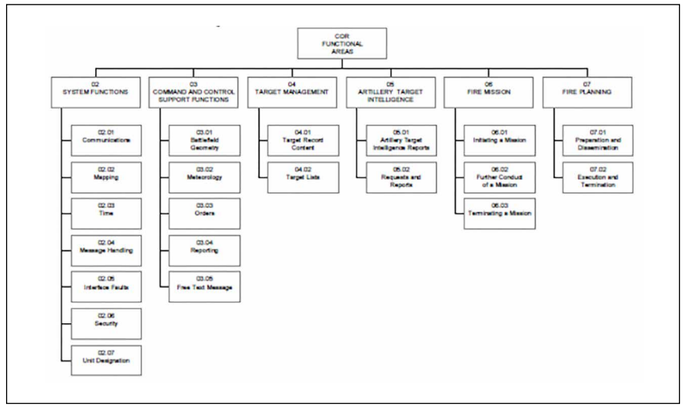


**Figure 2:** NATO AArty P-3 – Level One and Level Two Requirements

Repot 303, further defining the technical requirements that articulate the effects/outcomes required to be delivered by the digital fire support system.

This standard developed a simple system to describe the flow of digital information (Figure 1). This flow of information is understood to utilize prescribed military standard messaging formats and is related only to lethal fire support, all traffic indicated are assumed to be bi-directional.

The system was developed assuming that national systems will be responsible for developing the relevant message to allow transmission through the gateway or via direct connectivity in a multinational environment.

ABCANZ Standard 2124 identifies the key constraints of the digital fires system being that the standard message formats utilized are wholly owned by the US. Therefore ABCANZ nations must establish working groups supported by US Army or USMC to define program requirements, and convey change proposals.

The standard message formats utilized by ANCANZ Standard 2124 are the following;

- Mil Std 6017 Variable Message Format, Engineering Change Proposal 1,
- Mil Std 6016 Link 16, and
- Mil Std 6040 US Message Text Format.

ABCANZ Standard 2124 provides the message requirements for Mil Std 6017 implementation and further identifies critical messages which should be completed as a matter of priority to allow nations phased implementation of the standard. The implementation of Mil Std 6016 and 3011 will allow for an immediate reduction in interoperability gaps between AMD C2 systems and joint fire networks. Mil Std 3011 implementation should be the first focus of nations, employing the robust message set within Mil Std 6016.

**Discussion**

Within ANCANZ documentation there exist deficiencies, the majority of which have been identified by ABCANZ representatives. Primarily these deficiencies relate to aligning of ABCANZ standards and NATO Stanags, an example being VMF messages not being aligned to A Arty P-3 resulting in issues in the sharing of fire planning information across national boundaries. Doctrinal differences between ABCANZ nations result in their own set of issues, the US doctrine of requesting and allocating fires as opposed to the British doctrine where fires are ordered. This difference can result in observers receiving a different method then intended and the resulting effect not supporting their ground force commander.

Review of NATO Documentation

Canada is a member nation of NATO and as such interoperability within NATO is a priority of the Canadian Army. NATO standardization agreements (STANAGS) and doctrine together are the most internationally comprehensive and form the starting point for interoperability solutions. The foundational document for NATO digital fires is Artillery Procedures for Automatic Data Processing (ADP) System Interoperability, AArty P-3. AArty, P-3 provides the common operational requirements, technical requirements, and voice templates to be utilized by artillery formations and units from NATO and PfP nations operating within a multinational force. The use of this document allows for both the automatic transmission of formatted messages and the use of voice communication between all national systems.

The common operational requirements (COR) specify the operational requirements for which the ADP interface need to support in order to maximize interoperability within NATO. The ADP interface allows for the co-operation of units equipped with an ADP system across a joint boundary, it also allows for a units not equipped with an ADP system to interoperate. The COR has been structured to capture the core requirements which when implemented will provide for limited interoperability.

The purpose of the technical requirements is to create the technical foundation for the implementation of interfaces between ADP systems. The interface described is the software solution and does not detail the associated hardware or communication system. The interface will provide the exchange of secure and clearly understood data between systems in or near real-time, allowing the interfacing artillery C4I systems to continuously exchange target information,

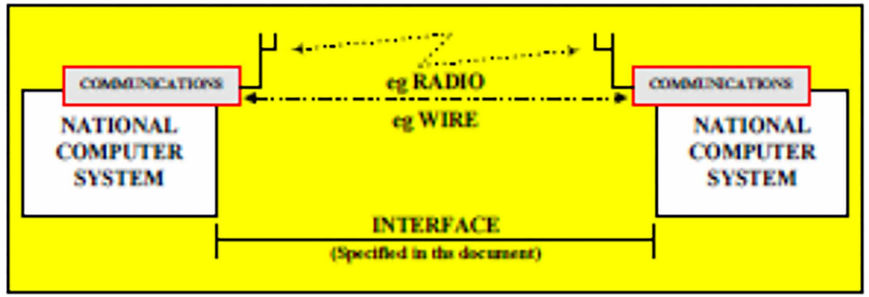


**Figure 3**. NATO AArty P-3 – Interface Description

calls for fire (current and planned operations), information of friendly units, and other necessary information in order to facilitate fire mission processing and fire planning.

The figure above indicates where the interface works in relation to the ADP systems of two NATO nations. The interface allows for the transmission of data from one nations ADP system to that of another nation, allowing both nations to work in their own language and in a manner of which they are familiar.

The inclusion of voice templates allows for the use of ADP systems when a data link is not available or when a nation does not have the ability to work digitally. The use of a voice template ensures the integrity of the messages is not lost during its transfer from manual to digital systems.

### Discussion

NATO digital fires documentation is robust and detailed, describing and detailing the integration of ADP and non-ADP nations. A review of this documentation indicates there are deficiencies which limit the ability of NATO nations to fully benefit from digital fires. The primary deficiencies identified in NATO documentation are a result of the fluid and ever expanding nature of warfare. Currently there is no ability to conduct non-lethal fires within a digital fires system, in addition there is no support to the targeting process either dynamic or deliberate targeting.

### Conclusion

Digital fires in a multinational construct remains an evolving topic, with many collaborative programmes and initiatives working to ensure interoperability. While the ability to conduct digital fires has existed in many nations, it remains a nascent ability to many of the ABCANZ and NATO nations. As such there remains deficiencies within digital fires, from both a procedural and technical perspective. These deficiencies limit the ability of digital fires to act as the force multiplier it could be and allow nations to reap the full benefits which a completely digitized system would afford.

ABCANZ and NATO digital fires continue to advance, ever evolving and progressing as more nations develop their digital capabilities. In addition to the deficiencies noted previously, it is worth mentioning the need of both ABCANZ and NATO to develop and publish further information on the procedural use of digital fires (TTP's and SOP's). The foundational doctrine for artillery remains the same for digital and manual fires systems, however the C2 structure afforded by digital fires allows for distinctive mission sets which should be captured in doctrine to fully take advantage of these abilities.

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# OPINION:

## *Relevancy of the Battle Group Fire Support Coordination Center*

WO P.B. COLLIER

THIS PAPER EXPOSES THE NECESSITY OF HAVING A BATTLE GROUP (BG) FIRE SUPPORT COORDINATION CENTER (FSCC) AND THE RELEVANCY TO WHICH IT HOLDS. AS THE TIMES CHANGE SO DO THE WAYS WE TRAIN MAKING IT RELEVANT TO HAVE A BG FSCC. HAVING A BATTERY COMMANDER AND THEIR CREW MEMBERS TRY TO KEEP UP WITH ALL THAT IS ENTAILED IN THE WORKINGS OF AN FSCC FOR THE PLANNING AND COORDINATING OF ALL THINGS FIRES AND DETAILED BATTLE TRACKING, WHILE STILL PROVIDING SUPPORT DURING OPERATIONS WITH THE BATTLE GROUP COMMANDER WOULD NOT BE ACHIEVABLE IN TODAY'S FAST PACED BATTLEFIELD. THIS IS WHY WE REQUIRE A BG FSCC. THAT BEING SAID THE EMPLOYMENT IN GARRISON OF AN FSCC COMPARED TO BEING DEPLOYED ON EXERCISE OR OPERATIONS MUST BE EXAMINED AS WELL. WHEN IN GARRISON THERE REALLY IS NOT GAINFUL EMPLOYMENT FOR ALL MEMBERS OF THE FSCC.

Before we can discuss the relevancy of the Battle Group (BG) Fire Support Coordination Centre (FSCC), we must first understand the role of the FSCC and what is required from it. The FSCC is established in all levels of Headquarters (HQ). It is similar to a central hub for all fire resources are coordinated and synchronized. This includes planning fires in conjunction with the maneuver arms commanders plan, requesting higher level fire assists to reinforce operations, and deconflicting and synchronizing all fires. These are just a few of the roles and responsibilities of the Fire Support Coordination Center. Here I will look at the importance of the Battle Group FSCC as well as their employment not only on operations but in garrison.

### Method/Approach

The direction I went to establish my findings were conducted by utilizing current doctrine, as well as reaching out to members within the Canadian Armed Forces (CAF) who have experienced employment within the FSCC. Using my own experience of taking a BG FSCC through high readiness training as part of the LDSH BG as the FSCC WO, and my employment in C/S 95 as part of 1RCHA, I will attempt to reason its relevancy.

### Review

Maj W.H. Hunt, former BC Z Bty of 1RCHA, has experience through multiple deployments to Afghanistan, high readiness training with LDSH BG as the Battery Commander, and the British exercise in Suffield Ex Prairie Storm as the Battery Commander. His take on the use of doctrine:

*"Obviously if a bty's guns are in DS [Direct Support] at the BG level, a FSCC is required. If they're brigaded, the Bde FSCC can manage movement of the guns, based on the totality of the battery commanders' plans, but I haven't seen a post-Afghanistan Bde FSCC manned heavily enough to have the level of SA required to deal with minute-to-minute BG-level (including pers and log) issues"*

Now, his take on location:

*"Depending on the BG Comd, the odds of the BC's Party being IVO the BG CP are pretty low – on BATUS the Household Cavalry CO specifically wanted to leave the HQ completely alone while doing the planning cycle. As the BC is always in the CO's hip pocket, you need a Fires rep at the CP to answer questions and help plan – i.e. Sebastian in Suffield and you in Wainwright, especially if 9 TAC is far enough away to develop spotty comms. In a perfect world, we would have had a FSCC O as well. If you pull the nearest FOO in for planning, that supported company loses their effect and increases unwanted movement on the battlefield".*

*Maj Hunt stated "There's no way that a minimum-manned BC's Party can manage present-day 24/7 ops by itself. The infantry/armoured CP runs without the CO and his party – it's too much to expect CC G19 to travel all day with an Inf/Armd CO and then roll back into the hide and maintain the CP as well".*

*Finally, his take on the equipment "With only two nets in a LAV, one arty vehicle can only monitor 2/3 of Bde Fires, BG Comd, and Bty. We really could have used a battery net, and the all-informed Bde Fires net was far too busy. The dispersed nature of the modern battlefield pushes radio ranges to their outer end without plentiful RRBs, as we found constantly in Suffield. It's great for the Artillery to think about these things on our own, but in the end, we exist to support the combat arms. They have grown used to depending on us for all the things we do, and the cost of an extra LAV and 4-6 pers is within the realm of the possible".*

Maj. K.J. Woodill, BC of A Bty, 1RCHA and former IG at the RCAS, recently returned back from a deployment to Latvia as the BC of Z Bty stated:

*"There is for sure the need for the FSCC O to be the lead fires planner in the BG and the BG CP needs to have a link to the fires net. So the 4-6pers team of O/WO/JTAC/SIG/SIG/SIG is justified, but what do they own and what does 95 own. There is a contrast in American style and Canadian style procedures. Canadian style - ATGs come with the gun battery and therefore the Bn fires net is the gun net American (Latvian) - ATGs are part of the Bn and have a Bn fires net with mortars, FSCC, and FOOs. The guns are separate and have their own nets. When a FOO is going to shoot a fire mission it is done by joining the bty net (leaving the Bn Fires) or through the FSCC. We like ours much better because it uses all informed nets"*

**Discussion**

The minute to minute fight that is happening at the BG level can be extremely difficult to track. To only utilize the Battery Commanders (BC) party to track the BG would be impossible without the presence of his/her FSCC being established in the BG Commanders Command Post.The integration and coordination of fires at this level would not be achieved due the fast moving Battle Group Commander maneuvering around the battle field. During the movement around the battle space the Battery Commander is required to be with the BG Commander. This practice is great in a planning aspect as the Battery Commander is in the direct know of the BG Commanders plan; however, to have the crew of the BC maintain 24hr operations without his/her FSCC would not be advisable, and thus the importance to the BG FSCC. The BG FSCC in conjunction with the Battery Commander's plan to support the BG Commander will request and delegate assists under the direction of the BC. If this were to only be handled by the Brigade (Bde) FSCC it would almost be impossible for this level of integration and tracking.

If we compare the BG and Bde FSCC in today's training they work very similar with the exception of the in-depth planning involved at the Bde level. At the Bde level they also have to plan the resupply, Batteries who will support what part of Operations going on, and manage the requests for assets, and incorporate the movement of guns to ensure they are positioned to support operations. If there were an absence of the BG FSCC the detailed tracking of all friendly forces would be much more difficult. The fast moving BG would not be tracked and supported with fires as it is currently done. The BG FSCC has the ability to be in the direct know of the BG Commanders plan and can push the information to higher Headquarters. This overall allows the integrated support for all fires to support the intent of the BG Commander.

The idea of not having a BG FSCC in my opinion would be extremely difficult for the BG Headquarters (HQ) Command Post (CP) to deal with. They have become reliant on the presence of our FSCC within their CP, and the ability to request alternate effects and synchronize and integrate fires to their plan. This would only be adding extra steps to the BG HQ if the FSCC was not present. It could also cause confusion with requests from the BG HQ Command Post (CP) to the Bde FSCC; thus creating the risk of key information being misinterpreted and losing vital time. No matter the scale of the deployment whether it be BG, Bde, or Div each agency will have their own respective imbedded HQ element. Even though the plans come from the higher HQ, having the BG FSCC present is key when providing advice on fire support. The BG FSCC is able to manage the resources allocated to the BG and ensure they are used efficiently. By having the BG FSCC manage the resources it can allow the Bde FSCC to concentrate their efforts on the larger picture.

With the integration of digital tracking on the battle field it is said that eventually each individual soldier will be able to be tracked. This is a benefit for the BG HQ Command Post, and each level of HQ; however, the amount of clutter on the digital tracker at each higher level CP would be astronomical. This would lead to confusion when looking on the digital map. Trying to keep everything up to date within the Bde CP while maintaining a manning of seven persons would not be near as robust as would be required.

We live in an environment where the possibility of the threat of electronic warfare exists. If it were to happen, the tracking of friendly forces at the Bde FSCC would be almost nonexistent. The BG FSCC is tracking all movement at the BG level. As the Bde FSCC is tracking all units as well, but on a larger scale on their battle map. Having the BG FSCC tracking each individual detachment and call sign provides the advantage to still continue the fight if we were interrupted with an electronic attack. The BG FSCC knowing where friendly forces are located allows us to continue the fight and thus reducing the chance of possible friendly fratricide.

Having recently returned from our foreign visit in the United Kingdom, I had the opportunity to discuss this topic with members of the Royal Artillery in Larkhill. They employ their Joint Fires Center (JFC) the same way we employ our FSCC; they have an established JFC in the Battle Group Command Post. The working relation between the two levels and the BG CP and the next higher level is crucial for their tracking and integrating of all things fires related.

Even though they are going to a digital tracking system, as we ourselves are, with the end goal to be fully digital, they have not given any thought of losing their BG JFC as it plays too big of a role in the BG HQ. They also expressed the same opinions as myself with the level of tracking and that the extra work load placed upon the Bde. FSCC would not be advisable.

We can now see just how relevant the BG FSCC is, but must also look at the way the current FSCC is employed not only in the field and operations, but in garrison. In the field units the FSCC's are currently employed under the Gun Batteries that they belong to. The members of the FSCC fill key positions within the Battery; the FSCC Officer is also the Training Officer within the Battery, the FSCC WO is the Training WO, and the FSCC Sgt. is the Training cell 2 IC. For the remainder of the FSCC members there is not a set position for them in Garrison.

Prior to the stand-up of the new Observation Post (OP) Battery in the field units the OP parties fell under their respective Battery. The idea of the OP Battery is to ensure collective training and standards are maintained throughout the OP's. Prior to the standup of the OP Battery the FSCC along with its respected OP parties belonged to the gun Batteries. This is where the FSCC with the OP parties were their own Troop and the FSCC WO was the Troop WO, and the FSCC Officer was the Troop Officer. Acting as their own Troop allowed for a constant connection with the FSCC and the affiliated OP parties. Unlike today where the FSCC falls under the Battery Head Quarter (BHQ) Troop and not in the OP Battery leaving a communication disconnect.

The employment of the FSCC within the Battery can go two different ways, command and control under an OP Bty or under a Gun Bty BC. I believe that if the OP Parties should fall under the Gun Battery's command as the Artillery Tactical Group (ATG) cell. The structure should look like the following: The Battery FSCC will man training positions within the Battery, and also act as the fourth OP party in the Battery on exercises. It is also possible to have the Battery FSCC deploy on all Battery level training. Currently, units are not always deploying FSCCs on Battery level exercises which is resulting in skill fade and complacency of those manned in the FSCCs. It is common for members who are not involved in training that their skills and knowledge diminish and it becomes obvious when conducting workup training and deployments, the effectiveness and performance is below the standard.

**Conclusion**

At the BG, Bde, or Div levels there will be a requirement for an FSCC. The duties at each level are similar, however the BG FSCC is specifically important in achieving the BG Commanders goals by advising, planning, and synchronizing fires at a tactical level. If we were to lose the support of the BG FSCC it would hinder our flexibility on how we employ our FSCCs at higher level HQ. The level of threat and the size of unit that we deploy will always dictate the level of FSCC(s) that will be required. So in today's battlefield the BG FSCC remains critically relevant. This is a cell that must be maintained, employed, and equipped properly, not only on deployments, but on training exercises as well.

# PERMANENT REQUIREMENT FOR A SMALL UNMANNED AERIAL VEHICLE DEPLOYMENT SITE

WO S.D.R. WALKER

THE NEED FOR A SUITABLE STATIC DEPLOYMENT SITE IS NOW UPON US. THE CANADIAN ARMED FORCES HAS PURCHASED A SYSTEM THAT WILL REQUIRE LIVE FLIGHTS TO TRAIN AND MAINTAIN CURRENCY OF ITS SOLDIERS. THIS WILL REQUIRE AT A MINIMUM 4 LARGE SCALE MOVES EVERY YEAR JUST TO RUN COURSES AND SUPPORT EXERCISES, INVOLVING CRANES, FLATBED TRANSPORT AND LENGTHY TEARDOWN AND SETUP TIMES. IF A DEDICATED SITE EXISTED THIS WOULD BE THE MOST COST EFFECTIVE MEANS OF MAINTAINING A HIGH LEVEL OF CURRENCY. THIS WILL ENABLE SOLDIERS TO PRACTICE FIELD CRAFT, DEPLOY SPOKES TACTICALLY FROM AN ESTABLISHED LOCATION THUS BUILDING CONFIDENT QUALIFIED SOLDIERS.

The purchase of the CU 172 Blackjack, this has placed the Canadian Army back onto the map in regards to long range Intelligence Surveillance and Reconnaissance (ISR) capabilities. This 110 lbs system will provide Commanders the sustained battlefield coverage they require to ensure the real time data needed in 24 hour operations enables them to make key decisions on the battle space. With a range of over a 50nm/93km the Blackjack will be able to cover the entire Gagetown range from a single deployed location. This does not mean the system will not move, or a spoke will never be deployed it however defines the need for a dedicated Ground Control Station (GCS), launcher, STUAS recovery system "SRS", maintenance facility and operations building. Within this paper I will discuss how we will be able to maintain currency of soldiers, support the needs of the CAF and ensure the preparedness of a deployed aspect of Blackjack in a spoke or site location will meet the tactical requirements of today's modern fight.

While conducting my research I have devised some options how to ensure a stable site can be located in one location in the Gagetown training area without losing sight of ensuring tactical needs are also being met. I have looked at many designs and what I have come up with as a sustainable site is a 40' x 80' with large bay doors to ensure a GCS loaded onto the back of a truck can be placed inside if need be. This size shelter will not only house 2 GCS' it will also be able to provide a storage area for the SRS, launcher and enable all maintenance to be conducted inside. There will need to be enough room to house a CP style room with radio installs and windows to monitor launch and recovery, the roof must be accessible which will allow for placement of the parabolic dish for greater line of site capabilities. A dedicated washroom facility with 2 showers for each gender to allow for comfortable sustained operations. The tactical aspect of having a fully functional site is that the spoke can easily be moved from this location anywhere within the training area. There must be enough room co located onsite to conduct practice of setup, teardown and deploy a spoke to ensure cam concealment and local protection is to a high standard prior to pushing into the RTA.

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**Figure 1**
CU 172 Blackjack launched from Mark 4 Launcher







Currently there is only one approved location to conduct UAS operation and the location chosen is Blissville Airfield. During the era of ScanEagle flight camps were generally every 3 months and supporting Combat Team Commanders courses and the annual Regimental EX provided enough time to maintain currency and skillsets. The 6 month rotations in Afghanistan and aboard ships provided our alternate means of keeping soldiers up to date on qualification standards. Now without a tour rotation we will be providing a single source location IOT generate qualified soldiers and maintain their currencies on all aspects of the equipment as this is not a leased system, no Field Service Representative support. Providing our soldiers with a stable training site will enable all battery's the ability to share resources and train soldiers collectively at detachment or troop level where required.

A permanent site location does not mean that soldiers will strictly train from there. It will allow them to already have resources deployed to the field in which they can take and deploy wherever the need is required. The need to train soldiers that can pick up and move is very apparent in today's modern warfare, ensuring that we can move with a brigade on the battle field is of the utmost importance, still however this will most likely be happening with a deployed attached spoke enabling extended range capabilities for deep ISR. We must be able push boundaries daily and get back to basics by becoming more comfortable in taking risks, this will be the only way we create a sound group of qualified soldiers.

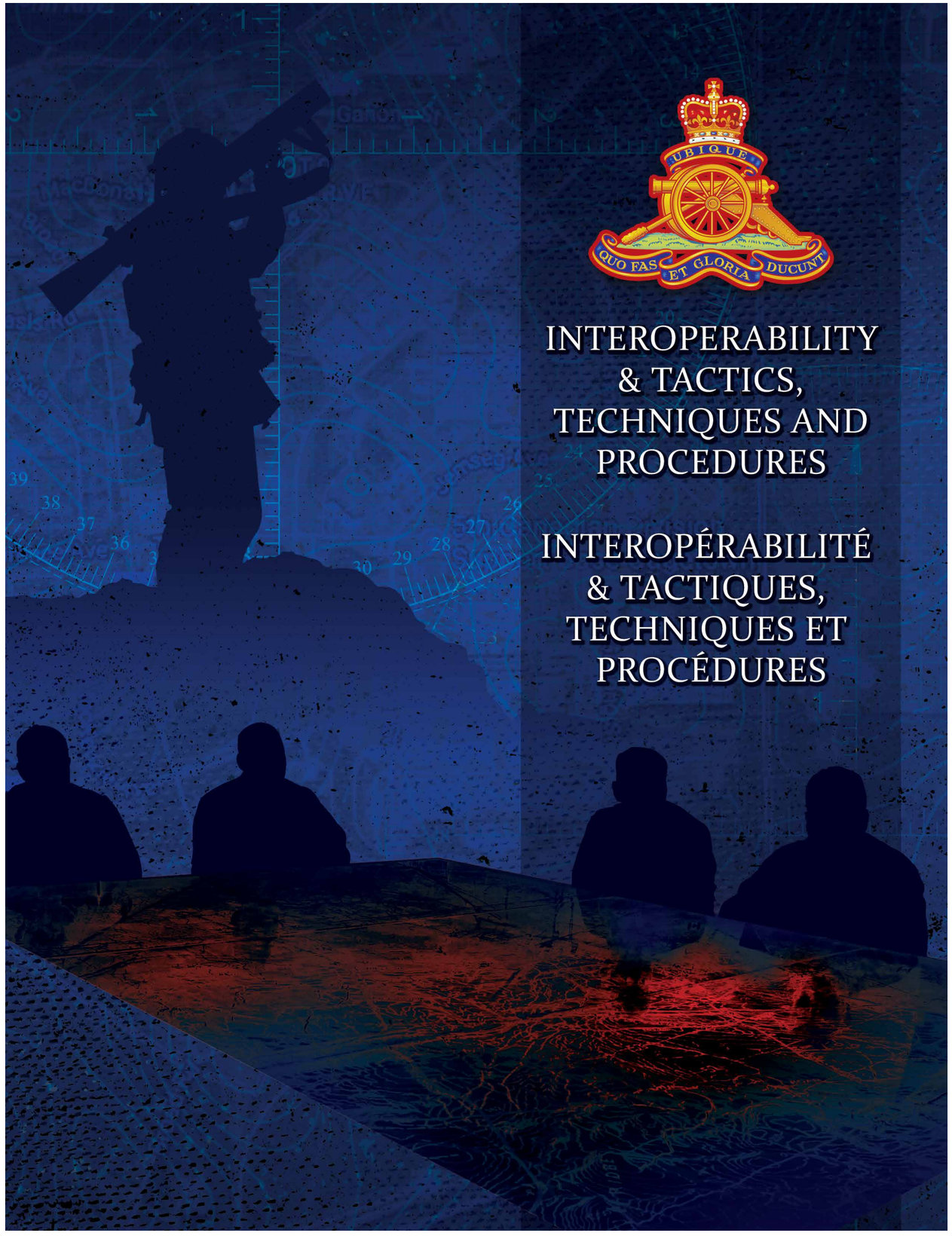
Blissville Airfield is my choice for a deployment area and my supporting arguments for this are as such. All runway locations must be sighted to support a shallow runway approach this airfield does support this however some trees in the coming years may need to be removed. Power is already located at the site, it is a proven launch and recovery area during our 6 years conducting flight camps and exercise support from this location. It is easily accessible year round on route 660. Line of site has always been great when conducting previous UAS operations from this site. The area is cleared and could be easily adapted into a fully functional permanent site. It allows for easy access into the training area to deploy spokes, Day hill, Knowlton hill, Petersville and Springbok bivouac are all proven spoke locations and are within a short driving distance and give proven line of site handoff areas.

The possibilities are endless for Blackjack but we owe it to our soldiers to have the ability to train every day in a realistic environment and the only way to do this is by giving them the resources to set them up for success. With potential deployments on the horizon we must ensure the soldiers we are training are able be as technically and tactically prepared for what lies ahead, we owe this to them.

In conclusion, defining a simple yet effective form of infrastructure will enable not only the Blackjack to utilize this location but future designs of UAS systems. UAV's are the way of the future and are only becoming more useful in modern warfighting. The need is there to be at the forefront of training, to provide our soldiers with the best preparation necessary to support all missions to come.

PHOTO CREDIT ALLEN RANDA

**Figure 2**
Photo of design template for GCS, Maintenance, storage facility
Sapphire Construction, Inc. Castle Rock, Colorado.




# INTEROPERABILITY & TACTICS, TECHNIQUES AND PROCEDURES

# INTEROPÉRABILITÉ & TACTIQUES, TECHNIQUES ET PROCÉDURES

# REQUIREMENT FOR SUPPRESSION OF ENEMY AIR DEFENCE SPECIAL PROCEDURE

## *Proposed Implementation*

CAPT A.R. BURKE AND WO J.P.L. BOLAND

**Discussion**

To examine this topic, the definition and types of Suppression of Enemy Air Defence (SEAD) will need to be understood. The United States Marine Corps (USMC) has an excellent definition of SEAD; "the application of sufficient, expedient force to facilitate achieving other missions or objectives".[1] NATO and Canada define SEAD as an "activity which neutralizes, temporarily degrades, or destroys adversary air defences by destructive and/or disruptive means".[2] While this definition is useful, it is also important to keep in mind the focus on expediency highlighted by the USMC definition. For this analysis, SEAD will be broken down into two types, planned and immediate. Planned SEAD is planned and conducted by a higher headquarters, fire support coordination cell (FSCC), or similar integrated fires cell, utilizing either a deliberate or dynamic targeting cycle.[3] These SEAD missions would likely be engaged with air or surface assets held at the Division or higher level. Planned SEAD missions will be conducted on a longer timeline, such as to fall within the 72 to 96-hour air-tasking order cycle.[4] The intent of these planned SEAD engagements is to facilitate overall air superiority or for specific air interdiction mission or other deep air engagement.[5] Immediate SEAD are those SEAD requirements identified at a lower formation, most within a Brigade AO.[6] These missions are typically needed to facilitate close air support (CAS) for the brigades maneuver units or a brigade air mission. These must be prosecuted within hours, or even minutes, to be effective. These missions often originate at the lowest levels and are pushed upwards.[7]

How to execute planned SEAD is clear within Canadian doctrine and is outside the scope of this paper. The focus instead is the glaring lack of artillery TTPs to conduct immediate SEAD missions. Canada is the only ABCANZ, and one of the only NATO nations, without an artillery specific SEAD procedure. Canadian doctrine states that, within the Brigade AO, through most phases of battle, it is the role of the Artillery CO, fire support coordination center (FSCC) or artillery observer to conduct and coordinate SEAD missions.[8] But the actual procedure for a fire-mission, the exact call for fire, is absent. This means there is a critical gap in Canadian artillery being able to deliver effective fire support. A gap exacerbated by the frequency that SEAD missions will be required.

Many scenarios within a Brigade AO would necessitate the use of immediate SEAD. The most common scenario is an artillery mission engaging a single enemy ground based air defence (GBAD) system to facilitate a terminal strike by a fixed or rotary-wing CAS platform.[9] While this is the most common scenario, it is useful to remember that it is not the only use for immediate SEAD. Pathfinders conducting the reconnaissance and set up of a LZ for an airmobile operation may identify an enemy GBAD system entering the area that requires suppression to continue with the mission. Similarly, SEAD may be required to facilitate the success of an airborne assault or the use of attack-helicopters providing intimate support to the brigade.[10] There are countless situations where aircraft provide critical lift, firepower, reconnaissance and ISTAR to a brigade. Any one of them could require the immediate suppression of GBAD systems.

Current OPFOR doctrine and orders of battle indicate a proliferation of enemy GBAD at all levels of operations.[11] Air defense systems form interlocking and overlapping coverage from the theatre spanning S-400 system, right down to the ubiquitous section of SA-18s found with every maneuver unit. Each one of these radars, command posts, and launchers form an integral part of the way the enemy fights the battle. The extreme mobility of many of these systems, such as the upgraded ZSU-23-4M and the venerable 2S6, means that the probability of encountering a GBAD system preventing friendly air action is extremely high.[12] Understanding that air power plays an extensive role in the deep







battle and are often unavailable for the close fight, it behooves commanders to leverage every minute of fixed or rotary wing assets that support them. The appearance of a single detachment of SA-18 MANPADS should not be the critical element that causes the failure of CAS or aborts an air mission. The Canadian artillery's lack of a SEAD procedure in conjunction with the OPFORs heavy reliance on GBAD highlights the need to immediately adopt procedures to close this gap.

The argument is frequently made that area neutralization (AN) procedures for Canadian artillery are sufficient to conduct any immediate SEAD requirements. The AN procedure is designed to neutralize a target via indirect fire. In artillery terms, this seeks to inflict 10% casualties on the target and remove it from battle until it is reconstituted.[13] SEAD is fundamentally a suppression mission. In the context of the close fight and immediate SEAD, the emphasis is on "temporarily degrading" the enemy AD capability to facilitate CAS or other air operations. Any neutralizing or destructive effects, while being a positive outcome, are ancillary to the original intent. In all cases, AN missions will require rounds to actually impact the target to achieve neutralizing effects of 10% casualties. With SEAD, in many cases having rounds land near a GBAD system will have sufficient suppressive effects.[14] While a less positive outcome than complete destruction, it is still sufficient to allow for CAS or the air mission. While this may seem a small distinction, when response times, speed of adjustment, and technical procedures are examined, the fact is SEAD missions must be conducted in a much quicker manner than AN.[15]

The implementation of a SEAD procedure is also needed because of the numerous interoperability issues that arise when conducting multi-national operations. In current operations, such as the Latvia eFP BG and Op REASURRANCE, Canadian artillery is increasingly working in support of multi-national operations. Observers from allied nations have been utilizing fires from Canadian guns and Canadian observers have been calling for fires from our allies. This is also extremely pervasive within the NATO join terminal attack controller (JTAC) community. The JTAC qualification is a NATO standard qualification and, over the last several years, NATO nations have continually increased the amount of multi-national integration of their JTACs. On operations, non-Canadian artillery observers and JTACs frequently work with Canadian maneuver and artillery units and vice versa. According to doctrine, one of the most common places for immediate SEAD to arise is from targets of opportunity identified by forward observers or controllers.[16] NATO doctrine states that in these situations, the resources allotted to prosecute the SEAD mission should come from the system that is currently supporting the unit who acquires it.[17] Meaning an allied observer team requesting SEAD could be allotted the Canadian guns in support of their maneuver element or vice-versa.

This gives rise to the following two problematic situations:

**a.** A non-Canadian observer or JTAC, who needs to conduct immediate SEAD with Canadian artillery in support of CAS for the maneuver element they are working with; and

**b.** A Canadian observer or JTAC, required to conduct immediate SEAD with non-Canadian artillery in support of CAS for their maneuver element.

In case 'a' above, the only way the Canadian artillery would be able to support this time sensitive request is to utilize the cumbersome and restrictive All Arms Call for Fire procedure (AACFF). This call would go to an Artillery FOO or FSCC to be edited, approved and sent to the supporting Canadian artillery unit and acted upon. Not only is this a slow and awkward process, the AACFF is a procedure that can only be used to conduct the simplest of AN missions. It cannot be used to conduct a versatile SEAD mission. In case 'b', with current training plans, Canadian observers and JTACs are not formally trained in any SEAD call for fire. Being unsure of and unfamiliar with how to conduct these missions there is a risk of miscommunication, unintentional effects and certain delay. The lack of a Canadian artillery SEAD procedure creates very probable situations where personnel are unable to conduct rapid and effective SEAD.

**Conclusion**

Be it the myriad of situations that require SEAD, the proliferation of enemy GBAD or the increasing amount of multi-national missions, a procedure is needed to conduct effective artillery SEAD. The Canadian artillery must immediately adopt a SEAD procedure in the form of a specific call for fire. There are two ways in which this can be done.

**Option 1.** Immediately adopt the SEAD model from the US Joint Pub JP 3-09.3 Close Air Support and its attendant supplement ATP 3-09.32 JFIRE. These documents are updated on a 3-year cycle and represent the very best of doctrine, cumulative experience and TTPs for CAS and air operations in NATO. This would put us in line with significant NATO nations and partners.[18]

**Option 2.** Immediately produce and adopt a SEAD procedure specific to Canadian Artillery Fire Discipline that can be used by Canadian artillery personnel to conduct rapid and effective SEAD. This procedure must also be similar to the above option in order to be used by both non-artillery and non-Canadian personnel familiar with the JFIRE who need to send calls for fire to conduct SEAD.

The Royal Canadian Artillery School, as the Artillery's Center of Excellence, should choose which of these options is most suitable, publish a CIG directive, and implement the directive into all future artillery training.

**Implementation**

Annex A outlines the two options for how a SEAD call for fire would look within artillery fire discipline. It includes fire orders from the observer, from the CP to the guns, as well as conventions and timings for SEAD.

Annex B contains an exhaustive list of courses affected, with relevant codes, performance objectives (POs) and recommendations. In general, the actual implementation of a new special procedure into existing courses is straightforward. For the command post (CP) courses impacted, this would mean one new period of lecture during the classroom theory portions and one new practical exercise during CPXs.

**Annex A**

| Observer Sequence | Option One | Option Two |
|---|---|---|
| **Observer ID** | 4 this is 41 | 4 this is 41 |
| **Warning O** | FM SEAD | FM Battery |
| **Location of Target** | Grid to Suppress _____<br>Grid to Mark _____ | Grid to Suppress _____<br>Grid to Mark _____ |
| **Direction** | Dir 4800 | Dir 4800 |
| **Description of Target** | ZSU 23-4 with 2x AT5 | ZSU 23-4 with 2x AT5 |
| **Type of engagement** | Continuous/Interrupted/<br>Non- Standard | SEAD |
| **Trajectory** | | |
| **Ammunition** | Proximity (HE by convention) | Proximity (HE by convention) |
| **Distribution of Fire** | | |
| **AMC** | | |
| **Method of Engagement FFE** | CAS TOT To follow OR<br>CAS TOT 14:38 | Continuous/Interrupted/Non- Standard SEAD,<br>CAS TOT To follow OR<br>CAS TOT 14:38 |

**Figure 1.** Proposed OP fire discipline for SEAD missions.

**Notes:** Below is the time scale for the three types of SEAD. They are each based off the CAS time on target (TOT). The issuing of CAS TOT is the executive order to fire. If CAS TOT has not been set, the observer will order CAS TOT TO FOLLOW; the guns may not fire until the actual TOT has been sent. CAS TOT to artillery CP will be sent in local time NOT Zulu.

**Continuous:** (TOT-60s) (TOT-30s) (TOT) (TOT+30s) (TOT+60s)
|----------|----------|----------|----------|
**Interrupted:** (TOT-60s)(TOT-30s)
**Non-Standard:** As desired by observer.
(E.g. Non-Standard, from CAS TOT -2min TO CAS TOT + 2 min).

The CPO will compute and issue gun data, issuing one gun with the mark (illumination by convention) and the remaining with the suppression data. They will use the computed TOF and calculate when they must order FIRE to ensure the rounds land at the first timing as ordered; either by continuous/interrupted conventions or on the non-standard timings. (Timings for mark to land are below.)

If there is no mark requirement in target location, the observer will only order *Grid to Suppress*. Omitting *Grid to mark* indicates the CPO is to utilize all guns in the battery for suppression.







Also, this would mean SEAD missions become an option for instructors to choose when assessing special procedures from the CP for CPXs, OPXs and FTXs. For the OP courses affected, during the special procedures POs it would also require one more lecture added and a practice mission during OPXs. Again, SEAD would become an option for instructors to use in practical assessments of special procedures or fire plans.

Practically speaking, the current fire control software (IFCCS) is capable of shooting SEAD missions with no modifications, this is discussed in more detail within Annex A.

**Conventions:**

**Mark:** 1 gun, mark, illumination, 1 round FFE
Mark lands on ground: Illumination – 45s prior to CAS TOT
Smoke WP – 30s prior to CAS TOT

**Suppress:** Remaining guns in Bty, HE PD, circle radius. Open in FFE at Rate 2 (155mm and 105mm).

| GPO Sequence | Either Option |
|---|---|
| Warning Order | FM Battery |
| Type of Engagement | SEAD |
| Trajectory | |
| Ammunition | Proximity (HE by convention) |
| Converge | |
| Bearing | (as computed) |
| Quadrant Laying | |
| Gun Correction | |
| Fuze Correction | |
| Fuze Setting | (as computed) |
| Load | |
| At My Command | AMC always used - the CPO will control the moment of fire to have rounds impact as per timings (above). |
| Elevation | (as computed) |
| Method of Adj or Order for FFE | Mark Gun – one round, FFE.<br>Suppression – (CPO calculates correct number of rounds for the timings as ordered by observer in case of non-standard, or as per convention if continuous/interrupted)<br>i.e. 10 rnds, FFE 30s |
| Description of Target | Supressing SA-18 section |

**Figure 2.** GPOs sequence of orders for SEAD mission

**Notes:** The IFCCS can be used to conduct SEAD missions with no changes to the software. In the case of suppression with a mark, two tabs are opened; one for the mark illumination and the other for the remaining guns HE data. In the case of SEAD with no mark, there is no special action required.

## Annex B

Integration of SEAD Special Procedure to following course TPs.

*Artillery Command Post Technician* Mite ID: 103074 Qual code: AFCS

PO 403 - Produce Firing Data for Special Procedure Missions using IFCCS – currently Deliberate Smoke is the only mission required to be tested - EO 403.01.

Recommendation: 1x period lecture on SEAD procedure as familiarization. Not tested on EO.

*Gun Area Technical Supervisor* Mite ID: 120588 Qual code: AKHY
*Pres GATS Mod 3* Mite ID: 120584 Qual code: AKHY

PO 405 - Supervise the Production of Firing Data using Manual Artillery Plotting System (MAPS)
PO 408 - Supervise the Production of Firing Data using Indirect Fire Control Software (IFCCS) for Fire Plans, as the Shooter.

Recommendation: 1x period lecture on SEAD procedure in PO 408. SEAD added to Special Procedures to be included in CPX/FTXs. SEAD not included in PO 405 as MAPS is too cumbersome of a system to conduct effective SEAD.

*DP1.2 Artillery Troop Commander Mod 2* Mite ID: 103962 Qual Code: ACZY
*Pres DP 1 Mod 6* Mite ID: 103962 Qual Code: ACZY

PO 111 - Supervise the Production of Firing Data - EO 111.01 to 111.18.

Recommendation: 1x period lecture on SEAD procedure in PO 111. SEAD added to Special Procedures to be included in CPX/FTXs.

*Forward Observation Officer* Mite ID: 120744 Qual code: ALEF
*Pres FOO* Mite ID: 120746 Qual code: ALED

PO 003 - Conduct Supplemental Fire Missions - EO 003.01 to EO 003.06.
(Note: Special Procedure missions are included within the above PO 003 even though title is listed as Supplemental Fire Missions).

Recommendation: 1x period lecture on SEAD procedure in PO 003. SEAD added to Special Procedures as option for assessment in all OPX/FTX to include TCs fire plans.

*Observation Post Detachment 2IC* Mite ID: 120500 Qual code: AFDA
*Pres OP Det 2IC Mod 2* Mite ID: 120502 Qual code: AFDA
PO 004 - Conduct Special Procedure Fire Mission as the OP Det 2IC - EO 004.01 to 004.08.
PO 005 Conduct Special Procedure Fire Mission as the FOO – EO 005.01 to 005.08.

Recommendation: 1x Period lecture on SEAD procedure in PO 004. SEAD added to Special Procedures as option for assessment in all OPX/FTX for PO 004 and 005.

*Observation Post Detachment Commander* Mite ID: 115334 Qual code: AIUP
*Pres OPDC Mod 2* Mite ID: 115464
PO 002 - Conduct a Fire Plan at Combat Team Level – EC 002.

Recommendation: SEAD added to Special Procedures as option for assessment in all OPX/FTX including in fire plans.

*Assistant Instructor-in-Gunnery*
Gun Area Mite ID: 120205 Qual code: AIUR
*OP* Mite ID: 120202 Qual code: AJUL

**Recommendation:** Should be included into setting a Special Procedure Fire Mission and Firing Planning portion (OP and CP).







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## Endnotes

[1] (M. C. Command 2016), 1-4.

[2] (NATO 2010), 0406.

[3] (M. C. Command 2016) (NATO 2015) (Director of Army Doctrine 1999) Each reference has its own method to divide SEAD into categories. For this paper, I have broken it down into planned and immediate largely using the division/brigade areas of responsibility. This is a composite of several references and not an exact copy. However, it is most like the USMC idea of planned and reactive SEAD.

[4] (D. J. Staff 2014), xvi. (Director of Army Doctrine 1999), Ch 1 and 5. In this context the planned SEAD refers to the deep and shaping battle found in both references.

[5] Ibid, xvi.

[6] (M. C. Command 2016) (Director of Army Doctrine 1999) Throughout B-GL-371-001, the Artillery CO or BC is listed as responsible for coordination for Brigade SEAD in all phases of war. Though it never has specifics on how to conduct it other than as a planned engagement.

[7] (NATO 2010), 0414. Although a publication mostly focused on air operations, this section specifically highlights the role observers and controllers must play in SEAD and how immediate SEAD is driven from the bottom up, usually with a call for fire.

[8] (Director of Army Doctrine 1999), Chapter 5.

[9] (D. J. Staff 2014), I-6. This is the definitive publication on CAS within NATO and the foundational publication for Canadian JTACs. Effective SEAD is listed as one of the conditions for effective CAS, indicating its importance. Unsurprisingly SEAD is referenced heavily throughout.

[10] (Director of Army Doctrine 1999), Chapter 5.

[11] (DATE, n.d.), OSC 2 Tier 2 ORBAT. (Grau 2016), 220.

[12] (Cranny-Evans 2017) (Grau 2016), 91. (Doctrine n.d.), OCS 2 Tier 2 ORBAT. (M. C. Command 2016), 1-13. The trend towards more mobile and maneuverable GBAD systems has been well documented. As the USMC highlights "this applies to developed, emerging and developing countries around the globe." There is an increasingly likely chance of encountering enemy GBAD in all operating environments.

[13] (CSO, 1998), 24.

[14] (M. C. Command 2016), 1-8.

[15] Ibid, 1-8.

[16] (NATO, 2010) 0414.

[17] Ibid, 0414. (NATO, 2015), Chapter 6. As always, requests for assets from higher or flanking units can be made. But NATO doctrine states the most responsive firing unit, and one that should first be tasked, is whoever is in direct support.

[18] Furthermore, as Canada is a signatory to the US JTAC MOA, these documents are the foundational doctrine for Canadian JTACs. All Canadian JTACs are already familiar with these SEAD procedures.

# PROPOSAL:

## *A CANADIAN ARMED FORCES APPROACH TO CLEARANCE OF FIRES*

CAPT R.G. HAUG

THE PURPOSE OF THIS PAPER IS TO ARTICULATE THAT EXISTING CANADIAN FIRE SUPPORT PUBLICATIONS ARE INSUFFICIENT AS IT PERTAINS TO CLEARANCE OF FIRES. CURRENT PUBLICATIONS INEFFECTIVELY DESCRIBE, FOR FIRE SUPPORT PLANNERS, THE PROCEDURES AND PLANNING REQUIREMENTS NEEDED TO CLEAR FIRES IN THE BATTLESPACE EFFECTIVELY. ADDITIONALLY, CURRENT PUBLICATIONS DO NOT ARTICULATE A COMMAND POST BATTLE DRILL WHICH CAN BE EMPLOYED BY FIRE SUPPORT PLANNERS FOR TARGET ENGAGEMENT, REQUIRING THEM TO DEVELOP THEIR OWN TOOLS. AS A RESULT, THERE IS SIGNIFICANT LOSS IN OPERATIONAL TEMPO.

### Introduction

The United States Army's Field Manual on Artillery procedures, FM 3-09, defines the clearance of fires process as ensuring "that fires attack enemy capabilities at the time, place, and with effects the commander desires without resulting in casualties to friendly forces or noncombatants."[1] At this time there isn't a defined procedure for completing this clearance process within a Canadian artillery task group or formation headquarters (HQ). Furthermore, current procedures for planning the clearing of fires are adhoc in that the existing Canadian Army (CA) approach is to make a new template for a given exercise or operation. The resulting impact of this is a measurable decrease in operational tempo and lethality on the battlefield. Adopting a standardized approach to clearance of fires will improve the Canadian artillery's ability to perform its tasks by reducing response times, improving accountability and increasing the lethality of fires in operations. The aim of this paper is to demonstrate the need to formalize a planning procedure and command post battle drill for artillery planners and advisors working within a HQ. This paper will then codify some of these planning processes for consideration in future Canadian publications.

### Review of literature

Evidence demonstrates that clearance of fire at brigade level HQs consumes a significant amount of the time during the prosecution of fires. A 2016 study at the Joint Readiness Training Center (JRTC) at Fort Polk on the subject of clearance of fires by LTC Pat Proctor, entitled *Ground Clearance of Fires: Part I* and *Clearance of Fires Part II: Air Clearance of Fires*, showed that the average processing times for target engagement by brigade combat teams (BCTs) was approximately 65% for counterfire operations and approximately 76% for pre-planned or targets of opportunity fire missions.[2] He noted that ground clearance of fire was hindered mostly by BCTs not correctly employing fire support coordination measures (FSCMs) and lacking sufficient situational awareness of friendly locations.[3] He also noted two issues related to airspace clearance in that "BCTs struggled to effectively synchronize airspace coordination measures and the unit airspace plan with surface to surface fires" and "BCTs struggled to integrate airspace management into their clearance of fires battle drills."[4] Therefore, the evidence suggests that there is a need to properly train clearance procedures within the individual training system and then validate them during live, virtual and constructive collective training.

The literature also tells us that our NATO allies conducting combat operations in counter insurgency threat environments like Afghanistan and Iraq have become comfortable decentralizing fire control, firing units, and fires clearances. At a very basic level this would seem to mirror the Canadian post-Afghanistan individual and collective training experience where procedures and drills from that operation still creep into the training of individual soldiers and units today. In his article *Seek, Develop, Share...Multinational Understanding* Col Gar Graves notes the need to codify roles and responsibilities beyond this decentralized experience.[5] He specifically mentions that a centralized warfighting approach that codifies roles will result "in a more efficient clearance of fires and airspace de-confliction."[6] From his arguments we can determine several important elements that drive the need for the CAF to determine its own HQ battle drill and technical clearance procedures. The first is that codifying battle drills will create efficiencies related to expected outcomes and timelines. The second element is an operational template that can be defaulted to or modified based on the maneuver forces tactical or operational objectives.

Allied publications are also noteworthy in that they provide guidance on planning and command post battle drills much more so than Canadian publications like *B-GL-300-007-FP-001 Fire Support in Land Operations* and *B-GL-306-002/FP-001 Field Artillery Operational Procedures* do. *ATP 3-09.90 Division Artillery Operations and Fire Support for the Division* and *ATP 3-09.42 Fire Support for the Brigade Combat Team* specifically explain in great detail the planning process for conducting fire support preparations or building an effective fire support plan.[7] As well, these publications have templated command post battle drills that cover basic, intermediate, and advanced dynamic targeting drills for a division or brigade command post that can be applied or modified as required to suit the needs of a given operational environment.[8] Additionally, our allies from the United Kingdom have built the *UK Joint Air Ground Integration Centre Handbook* which provides a flow chart battle drill for counter battery engagements and general target engagements that serve as the basis for templating their own tactical engagements with fires.[9] The conclusion we can draw from this is that the Canadian artillery is behind our allies and we should be adopting similar procedures for target engagements. Furthermore, because NATO allies have developed operational and tactical templates of their own there is a basis for building our own templates already.

### Discussion

When building any planning process or battle drill templates the single most important element to consider is the approach or "mindset" of that process. Firstly, what needs to be understood in the context of clearing fires is that the ground force commander owns the overall battlespace, including airspace below the joint coordinated level. *ATP 3-09.90* notes this as well stating "the supported ground commander is responsible for clearance of fires, including the integration of fires with other airspace users."[10] Secondly, artillery advisors must be prepared to effectively articulate risk to commanders and advise on courses of action through a specific "actions on." Given that the current operating environment envisions a peer or near peer enemy to be a possibility, "actions on" or battle drills need to be developed as it pertains to the conventional threat.

Of very real concern is the friction that occurs between airspace users and battlespace owners. LTC Proctor notes that "the most common complaint from aviators is that adher-

**Counterfire Average Mission Processing Times**

| Echelon Standard | Average | TC 3-09 Standard (Digital) | Delta |
|---|---|---|---|
| Brigade FC | **08:47** | N/A | N/A |
| Battalion FDC | 05:14 | 00:35 | +04:39 |
| Platoon FDC | 03:57 | 00:35 | +03:22 |
| M119A3 section | 01:13 | 00:30 | +00:43 |
| M777 A2 section | 05:31 | 01:00 | +04:31 |
| Average Total Time | **13:01** | | |

**Pre-planned and Target of Opportunity Average Mission Processing Times**

| Echelon Standard | Average | TC 3-09 Standard (Digital) | Delta |
|---|---|---|---|
| Brigade FC | **08:06** | N/A | N/A |
| Battalion FDC | 03:32 | 00:35 | +02:57 |
| Platoon FDC | 04:17 | 00:35 | +03:16 |
| M119A3 section | 02:47 | 00:30 | +02:17 |
| M777 A2 section | 02:11 | 01:00 | +01:11 |
| Average Total Time | **11:12** | | |

ing to air corridors and attack by fire positions limits their ability to employ their full range of capabilities."[11] Similarly, permissive airspace control restricts the responsiveness of indirect fire assets by burdening the ground force commander or the brigade airspace coordination center (ASCC) with managing a complex airspace picture. The tools most commonly used to delink airframes from the ground forces battlespace and air forces airspace is the coordinating level (CL) and the use of restricted operating zones (ROZ).[12] However, simply applying a CL or ROZ to all situations isn't appropriate as airframes and fires must regularly transit on either side of the CL or through a ROZ in order to achieve their required effects. There is no simple answer to resolving these requirements other than the appropriate planning and briefing of ACMs and FSCMs during orders and fires rehearsals, as well as, effective procedures for dynamically clearing fires when non continuous situations present themselves.

It has already been noted that the battlespace, and airspace within that battlespace (below the established CL or a specific ACM), belongs to the ground force commander. As a result, consideration needs to be made in terms of balancing the needs of the ground force verses the risk to air platforms operating within the battlespace. Several well established solutions immediately present themselves and are established technical norms within Canadian publications and procedures. The first of these is the development of effective ACMs produced by "air aware" individuals from the air component coordination element embedded within the ground force HQ.[13] The second is ensuring that airspace users remain disciplined in adhering to the airspace control plan.[14] For the most part these solutions are already largely maintained by existing CAF systems and little change to publications needs to be made other than to ensure they are sustained as effective skill sets during operations and training.

Clearance of aircraft can also be accomplished by other "less conventional solutions" which attempt to balance tempo and risk in order to achieve the commander's mission without endangering aircraft needlessly. LTC Proctor suggests that during the planning phase artillery planners create tools that can match the worst case maximum ordinance to range band templates by using tabular firing tables.[15] Thus, artillery planners can begin the clearance of airspace process before firing units can send their actual maximum ordinance. The second and more controversial balancing of clearing airspace with tempo and risk comes from commanders being prepared to accept greater risk to air platforms through an established "actions on" approach. During Exercise Dynamic Front 18 1st (UK) Artillery Brigade established that in order to achieve their mission airspace must be clear in less than 4 minutes. Thus, the 1st (UK) Artillery Brigade current operations cell immediate actions during the exercise was to inform the airspace coordination center to message air users in their area of operations of immediate inbound fires and if they could not clear airspace within 4 minutes time the commander, through his G3, would fire anyway. Simply put Canadian artillery planners should consider matching airspace clearance procedures to the threat they are facing. This can be accomplished through a fires advisor brief to the responsible commander or connecting it to existing threat metrics like the counter battery threat level. Additionally, commanders need to be willing, on balancing the risks, to accept the risk to aircraft in order to achieve the military effect on the ground required.

It should be noted that ground clearance of fires presents its own set of unique problems. Without proper ground clearance procedures the risk to friendly forces or civilians can be unacceptably high. That being said we should strive not to be too restrictive in our approach to ground clearance of fires because the "fog of war" will never allow us to have a universal understanding of everything in the battlespace. *FM 6-71 TTPs for Fire Support for the Combined Arms Commander* notes "field artillerymen cannot allow the definition of positive clearance of fires to mean only fires that are safe and do not violate FSCMs."[16] This statement should not be taken to mean we engage targets that are unsafe just that we not be "risk adverse" and balance military imperatives with a solid understanding of the battlespace. Typically, we mitigate the risk associated with ground clearance of fires "through prior planning, rehearsals, and careful placement of FSCMs."[17] It is also critical that positive ground clearance of fires be achieved through utilizing the best target location available, positive identification of the enemy, and eyes on target.[18] *Fire Support in Land Operations* does note these requirements stating that "positive control (during dynamic combat engagement) is the least restrictive BM (battlespace management) methodology but the most difficult to manage in practice."[19] Canadian publications like *Fire Support in Land Operations* and *Field Artillery Operational Procedures* do effectively articulate FSCMs, ACMs, and the need to de-conflict fires. However, existing publications do not expand much beyond these three tools and utterly neglect to discuss roles, responsibilities or CP battle drills.

In the context of clearance of fires digital tools and systems are revolutionizing fire support for many of our NATO allies. One of the reasons digital tools are so successful is they "enhance accuracy and timeliness of situation reporting and significantly contribute to improved situational awareness."[20] The obvious outcome will







be to allow commanders and planners to make better informed decisions and to inform superiors and subordinates of the changing current operating picture (COP) through the prompt transmission of new control measures and tactical locations. In the area of clearance of fires this flexibility offered by digital toolsets can be a "double edged sword" in that it can degrade existing analog skills like tracking the battlespace on a map. LTC Proctor notes these systems, in the context of the American experience, have "accelerated the atrophy of a procedure that is critical to ground clearance of fire... tracking the front line trace of subordinate units."[21] Future Canadian publications and digital systems must make note of this need and ensure existing analog skill sets for conducting blue force tracking are maintained. Additionally, our training systems must be flexible enough to instruct both digital and non-digital practices and ensure success even in operationally degraded environments.

Ultimately, it is battle drills, battlefield situational awareness, and effectively trained personal within a CP that will determine effective clearance of fires. Perhaps the most glaring issue with current Canadian fire support publications, in context of clearing fires, is they fail to articulate responsibilities and CP battle drills. *ATP 3-09.90* notes "clearance of fires battle drills should be approached from the dynamic targeting perspective to offer the timely integration of all available capabilities...to provide the desired effects for the maneuver commander under the direction of the G3."[22] *ATP 3-09.03* then articulates in depth exactly what a dynamic targeting battle drill will look like and how it would be implemented in a CP.[23] Being that current Canadian publications do not discuss battle drills or codify roles it would suggest our publications lack the required detail.

## Conclusion

In conclusion existing Canadian fire support publications and procedures are insufficient for instructing clearance of fire procedures to fire support planners and need to be considered for future revisions. Currently, there exists a considerable amount of literature and allied publications on the topic of clearance of fire that can help us develop our own tactical templates and publications. As we look to build publications and battle drill templates considerable thought needs to go into our "mindset" or approach to this problem. In doing so we must endeavor to balance our risk to friendlies with the real-world risk of not engaging at all. The fire support community naturally overcomes most risk by effective planning of control measures, battle tracking (both analog and digital), fires rehearsals, fire support synch matrix's, and other planning tools available to us. However, in order to ensure existing methods and future methods are properly adhered to we must codify processes through publications and instruction on the topic of clearance of fires.

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## Endnotes

[1] FM3-09.22 Chapter 6 Field Artillery Mission Planning, Preparation....and Execution, pg. 6-22.
[2] Ground Clearance of Fires Part I, pg. 13.
[3] Ibid, pg. 14.
[4] Clearance of Fires Part II, pg. 10.
[5] Seek, Develop, and Share....Multinational Understanding, pg. 9.
[6] Ibid, pg. 10.
[7] ATP 3-09.90, pg. 2-34.
[8] Ibid, pg. C1-C3.
[9] UK Joint Air Ground Integration Centre Handbook, pg. 38-39.
[10] ATP 3-09.90, pg. 2-34.
[11] Clearance of Fires Part II, pg. 13.
[12] B-GL-300-007/FP-001, pg. 6-20.
[13] Ibid, pg. 6-19.
[14] Clearance of Fires Part II, pg. 13.
[15] Ibid, pg. 13.
[16] FM 6-71 TTPs for Fire Support for the Combined Arms Commander, appendix F.
[17] FM 3-09.22 Chapter 6 Field Artillery Mission Planning, Preparation....and Execution, para. 6-110.
[18] Ibid, para. 6-110.
[19] Fire Support in Land Operations, pg. 6-15.
[20] FM 3-09.22 Chapter 6 Field Artillery Mission Planning, Preparation....and Execution, para. 6-106.
[21] Ground Clearance of Fire: Part 1, pg. 16.
[22] ATP 3-09.90, pg. C-1.
[23] Ibid, pg. C-1 to C-3.

# DIGITAL FIRES AND INTEROPERABILITY

CAPT M.G.K. KELLY AND WO T.M. THORDARSON

THIS PAPER WILL BRIEFLY EXPLORE THE CURRENT STATE OF DIGITAL FIRES WITHIN THE CANADIAN ARMY (CA), PREVIOUS CHALLENGES AND OBSTACLES OVERCOME IN THE SEARCH FOR A FULLY DIGITIZED FIRES SYSTEM. INTEROPERABILITY IS A KEY TO ANY DIGITIZED SYSTEM AS ANY FUTURE MISSION WILL MOST CERTAINLY BE IN THE CONTEXT OF A MULTINATIONAL DEPLOYMENT. ARTILLERY UNITS FROM MULTIPLE NATIONS MUST BE ABLE TO SEAMLESSLY EXCHANGE FIRES INFORMATION TO EXECUTE JOINT FIRES. A FULLY DIGITIZED SYSTEM REPRESENTS NOT ONLY A FORCE MULTIPLIER IN DELIVERING JOINT FIRES BUT ALSO INFORMATION DOMINANCE AND DECISION SUPERIORITY FOR FUTURE COMMANDERS.[2]

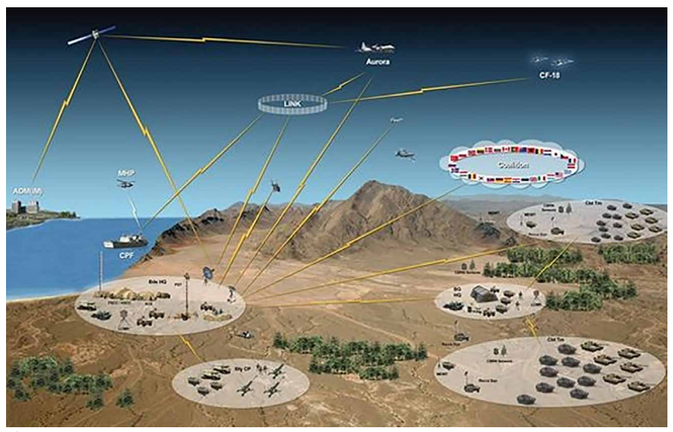


**Figure 1.**[1]

Digital Fires (DF) is defined as "the process of machine-to-machine (M2M) information transfer that enhances the fires process, reduces fratricide risk, and increases lethality, all due to the proliferation, speed, and accuracy that digital information transmission enables for decision making and targeting".[3] The pursuit of a DF system for the Canadian Army (CA) has been an ongoing pursuit for many years. Major General Juneau, Deputy Commander to the CA stated: "The CA will establish the appropriate levels of interoperability for land operations with other services and selected partner nations with a view to enabling success on future joint and multinational operations".[4] This direction from the Deputy Commander illustrates the critical importance of establishing digital infrastructure and systems to support operations abroad. A fully digitized fires system which maximizes interoperability and forms a near real-time fires Common Operating Picture (COP) is the end state in which the CA and the Royal Canadian Artillery (RCA) is striving to achieve. A digitized system will shorten the decision making cycle of commanders and ensure information dominance over our adversaries in the future. Interoperability is defined as "the ability to act together coherently, effectively and efficiently to achieve [Allied] tactical, operational and strategic objectives".[5] Recently, the CA has defined the goals of interoperability into three categories: Integrated, Compatible and De-conflicted. The goal of the CA is to reach the 'Integrated' category which allows forces to merge seamlessly and exchange information freely across a digital system.[6] This paper will briefly explore the current state of DF and interoperability within the RCA and the greater CA as laid out in the current Statement of Capability Deficiency (SOCD) on DF.

## Methodology

The current SOCD on DF states several capability deficiencies that were identified in a Table Top Experiment (TTX) on Digital Fires Interoperability (DFI) which succinctly frame the current problems with the DF system: Inability to integrate DF into a joint fires system, inability to contribute to the coordination of non-lethal fires, inability to generate a Land Fires Digital COP, inability to contribute fires information to the overall COP, lack of multinational (MN) interoperability for DF and lack of integration of command tactical software with fires software.[7] These deficiencies represent a severe capability deficiency for the CA and the RCA in delivering joint effects within the battlespace. In order to examine the problems within the DF system, four broad topics were selected to encompass the problem areas identified in the TTX and explore the DF problem: The current lack of network capability, lack of integration with the equipment and software, lack of interoperability with partner nations and requirement for progressive training on DF systems.








**Figure 2.**[8]

## Lack of Network Capability and Lack of Integration with the Equipment

Canada as a member of NATO intends to participate in future multinational operations, operations which will require the seamless exchange of information. The RCA is currently involved in several programs that enable us to participate in multinational joint fire operations. To this end Artillery System Cooperation Activities (ASCA) and ABCA's Artillery Procedures for Automated Data Processing (ADP) have developed Common Operation Requirements (COR) ensuring a common platform for each nation to develop, enabling seamless exchange of information. The Indirect Fire Control Software Suite (IFCSS) was developed as the RCA solution allowing us to meet these requirements. The IFCSS suite includes: Fires Management Control Application (FMCA), Observer Application (OBS), Indirect Fire Control Computer Software (IFCCS), TSM Application (TSM), Gun Display System (GDS), Safety Officer (SO), Fire Support Speak (FSS), Meteorological Operational Database (ODB) and the Sensor Message Dispatcher (SMD). The IFCSS digitization project is depicted in Figure 2.

The first area to examine is system functionality, which includes communication, mapping, time, message handling, interface faults, security and unit identification. While the RCA was able to meet the majority of these requirements, the largest challenge has been communication and network capability. There are three possibilities listed in the COR; Wired Network, LAN and Radio, ultimately the radio was selected as the network of choice for the CAF. The radio currently being used is the Enhanced Position Location Reporting System (EPLRS) Line of Sight (LOS) radio. Throughout the trials there have been several attempts to use the EPLRS radio to transmit fire orders over long distances from the command post (CP) to the observation post (OP) with mixed results. The limited success of the EPLRS radio can be attributed to its limited range capability (~10Km terrain dependent). The EPLRS radio can effectively send data from CP to the howitzer when properly trained signals personnel are available. The majority of trials that have been conducted to confirm the IFCSS software have been completed with a wired system. This has allowed the RCA to improve the functionality of the IFCSS, but has not yet addressed the inability to transmit fire missions digitally over long distances (>10Km) utilizing the EPLRS radio system.[9]

Capability Pack TOPAZ (CP TOPAZ) which includes EPLRS, Satellite on the Move (SOTM), Combat Net Radio Enhanced (CNR-E) and the Tactical Battle Management System (TBMS) are intended to solve the current connectivity issues experienced between the OP and CP, or Beyond Line of Sight (BLOS).[11] The current issues which the RCA has experienced with the EPLRS radio connectivity should be resolved by CP TOPAZ. Unfortunately, the SOTM capability will not be available for field trials until 2018 and therefore could not be tested earlier to assess its viability.[12] In theory when a fire order is passed from OP to CP (or higher HQ) with CP TOPAZ, the fire order will first attempt to utilize EPLRS to pass the data, if that is unsuccessful the order will be passed by CNR-E radio or SOTM depending on which network is available to send data. Figure 3, is a simplistic depiction of how CNR-E, EPLRS and SOTM networks would correct the

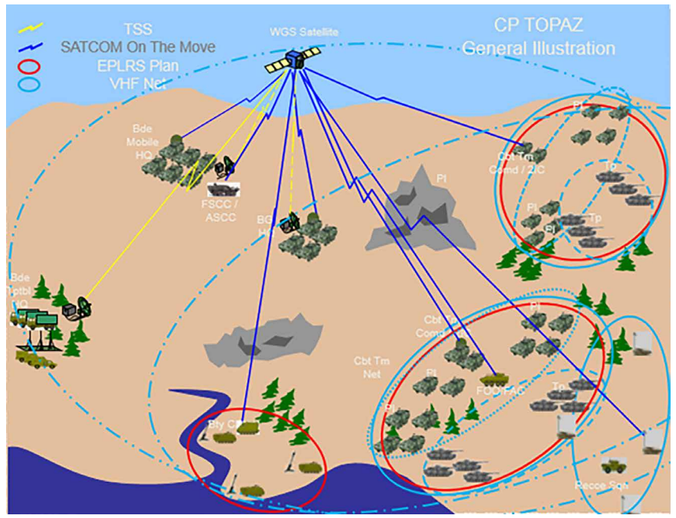


**Figure 3.**[10]

current connectivity issues experienced by the RCA. However, in order to have a truly digital system each OP, CP and the Regimental Command Post (RCP) should have SOTM added to their vehicles to supplement their LOS capability with the EPLRS and CNR-E radios. This would ensure that in a non-contiguous battlespace over vast distances BLOS data transmission will occur. The ability to transmit data over SOTM will allow for a larger volume of data to be transmitted faster than EPLRS and CNR-E can currently allow and will help to build the Fires COP.

The Second COR is Command and Control support Function which includes Communications, Meteorological Data (MET), Orders, Reporting, and Free Text. With this COR the largest obstacle has been MET. This system is currently capable of using MET however, it must support the request for MET as well as the transmission of this information. This has been added to the IFCSS program but integrating with the MET center to digitally provide the required types of MET has been the challenge.[13] The Target Management functionality of the IFCSS must provide the capability to manage targets between nations. This includes Target Record Content and Target Lists, as the IFCSS contains all the required information and has always used the NATO six-character alpha-numeric target number system. One of the newest additions to IFCSS is Artillery Target Intelligence, the basis for the employment of friendly weapon systems and this function contributes to the fires COP. This is an integral part of IFCSS and includes Artillery Target Intelligence Reports, Requests, and Reports. One of the largest challenges to the RCA is integration with STA and Air Defense equipment and software which is currently being discussed with IFCSS software engineers for a solution.[14]

The Fire Mission interface is the next COR and is the interface in which the IFCSS was developed. The requirement of the fire mission interface is to describe, in detail, what is necessary for a successful engagement of targets. The interface shall support fire for effect missions with conventional, improved conventional munitions, advanced and mine missions. This includes Initiation of the Fire Mission, Further Conduct of the Fire Mission and Termination of the Fire Mission. As this was the basis for the development of the IFCSS there have been few issues with its continued development. The largest change that has occurred is the development of the precision munitions portion of the software but over the last year, the Royal Regiment of Canadian Artillery School (RCAS) has invested significant resources to develop this functionality. The final COR is Fire Planning, the interface shall enable the transmission of the data and orders required for the preparation, dissemination, execution, and the termination of the fire plan. This seems to be the least developed COR within IFCSS as many of the requirements to develop it are dependent on the implementation and use of the other CORs, as well as the integration of equipment. The RCA must recognize and discuss the lack of integration with the equipment.

The current state of the CA DF is limited at this time by the ongoing equipment upgrades as well as the equipment limitations. The largest of these issues currently appears to be the new Light Armoured Vehicle (LAV) 6 Observation Post Variant (OPV), it has limited digital capability through the OBS application of IFCSS. Further, IFCSS is not currently available to a dismounted or light observers which limits the RCA DF capability. A variety of different options including the use of multiple types of radios to transmit the required data from IFCSS as well as a smaller more portable computing device are being explored. The lack of integration continues throughout Fire Support Coordination Centre (FSCC), Airspace Coordination Centre (ASCC) and the Surveillance and Target Acquisition Coordination Centre (STACC) due to the given software(s) being used. The RCA is currently unable to send STA engagement information from automated equipment as well as the Sensor Command and Control Planning Suite (SC2PS), which is the software that is primarily used within







the STA. As it is not integrated into the IFCSS, it does not allow for these systems to be efficiently employed as part of the larger network. The lack of integration into the Land Command Support Suite (LCSS), IFCSS, Battle View (BV), Tactical View (TV), Tactical Information Management System (TIMS), SC2PS and in the future, Tactical Battle Management System (TBMS), is a critical limitation.[16] In order to facilitate an integrated fires COP the software listed previously must be able to communicate, Figure 4 illustrates the LCSS framework.

### Lack of Interoperability with Partner Nations

In 1987, the Artillery Systems Cooperation Activities (ASCA) Program began with a mandate to enable allied nations to exchange artillery information digitally, from one nation's fire support software to another, regardless of language barriers or national procedures delaying the dissemination of information. ASCA aims to provide a digital software interface which allows one allied nations fire support system to send data directly into another nation's fire support system without the need of translation or liaison.[17] ASCA utilizes standardized automated data procedures in accordance with STANAGs 2934 (AArtyP-1), 2484 (AArtyP-5), 2245 (Fire Support Data Interoperability), and 5620 (Standards for Interoperability of Fire Support ADP Systems). The standardized messaging format which ASCA utilizes 'enables a point to point(s) messaging service that passes fires information in near real time across national boundaries'.[18] ASCA is currently the only fielded solution for multinational (MN) fires interoperability.[19] The program currently has five full members USA, France, Germany, Italy and Turkey with several other nations as sponsored members and unsponsored members taking steps to attain full membership.[20] ASCA contains 36 'interface message sets' broken down into eight message categories: Ammunition Fire Unit Status, Fire Missions, Meteorological, Non-Nuclear Fire Planning, Support Data, System Data, Nuclear Biological Chemical and Strike Data.[21]

In 2008, ASCA was considered by the CA as a solution for interoperability and DF, but a lack of resources at the time precluded Canadian involvement.[22] In 2016, the RCAS, as the center of excellence for the RCA led an initiative for the CA to join ASCA immediately as an Observer (Unsponsored). Briefing notes to both the Deputy Director of Artillery[23] and the Chief of Staff Army Strategy[24] stressed that ASCA may be the CA solution for 'interoperable, networked and digital fires, directly in line with the direction that the CA is heading'.[25] On 7 July 2016, Brigadier-General Macaulay (Chief of Staff

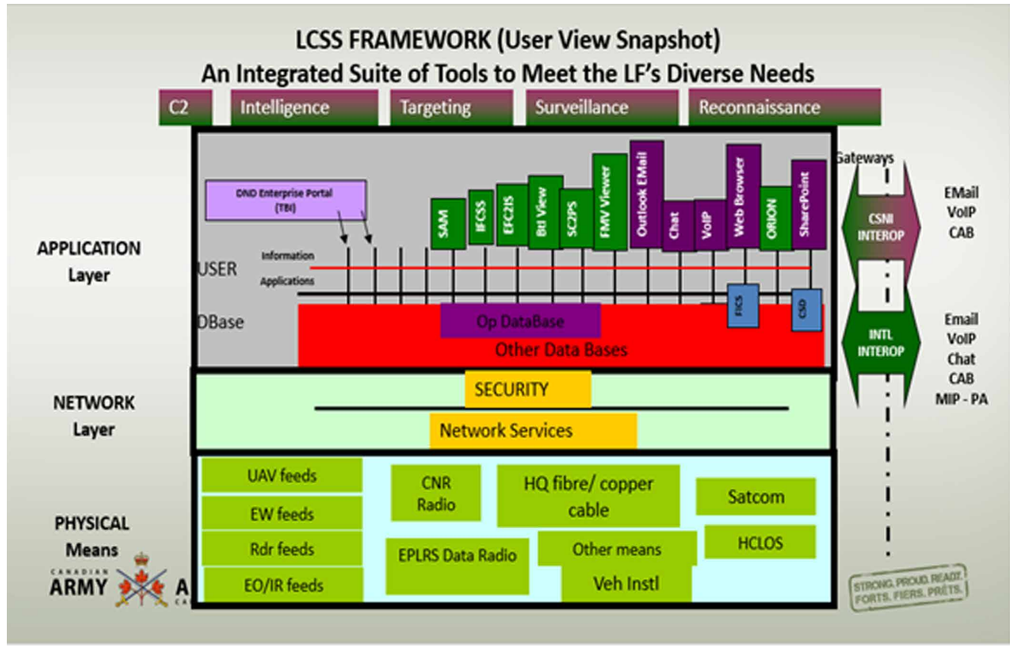


**Figure 4.**[15]

Army Strategy) requested the Canadian Army join ASCA as an Observer (Unsponsored), the request was approved.[26] Since the CA has joined ASCA as an Observer the RCAS has conducted several trips to ASCA meetings in order to better understand the program. The IFCSS currently employed within the RCA has the ability to support ASCA, however ASCA is not a common fire control system but an interface 'that enables a common framework within which national fire control systems can operate'.[27] The ASCA program will interface with the existing Fire Management Coordination Application (FMCA) within IFCSS. [28] The RCA and the CA have made considerable progress since its acceptance as an Observer in the program, but in order to begin testing the ASCA interface with IFCSS the CA should pursue full membership within ASCA.[29]

Although ASCA appears to be an ideal solution to interoperability as it relates to DF the program does have limitations. ASCA is currently limited to its 36 'interface message sets', where an interface such as Variable Message Format (VMF) provides a larger 'database' of message formats in the MIL-STD-6017 Functional Area Designator (FAD) for fire support.[30] At this time ASCA can only support meteorological messages in CM only. VMF is currently supported through the Digitally Aided Fire Support (DAFS) group which the USA and Australia are the primary driving forces, although the USA has adopted ASCA as their primary fires interface.[31] Although VMF provides a larger message database it is clear that ASCA is the primary means to address DF interoperability at this time. The RCA may wish to pursue both the ASCA and DAFS programs in the future as this would ensure the greatest possibility for interoperability during future missions.

During a visit to Germany 03-06 March 2018, the Instructor-in-Gunnery (IG) and Assistant Instructor-in-Gunnery (AIG) courses from the RCAS were given the opportunity to observe exercise Dynamic Front 2018. One of the aims of the training event was to exercise multinational (MN) fires with ASCA members (and aspiring members) in order to test the latest version of ASCA and identify any limitations of the program in a live firing environment.[32] The 1st (UK) Field Artillery Brigade (1 FAB) was among the primary training audience for the exercise and was controlling fires from USA, Poland, Denmark and Sweden. Dynamic Front 2018 represented the first test of ASCA connectivity in a live multinational role by 1 FAB. 1 FAB was utilizing the latest version of the ASCA program which was a software interface running on a standalone computer and not directly into the fire support software (FC-BISA). This was accomplished by a 'swivel chair' communications design where an operator was running the ASCA interface directly across from the FC-BISA operator. The next step for 1 FAB is to test and field a newer version of the ASCA interface which will be embedded into FC-BISA and have messages flow directly into their fire support software.

ASCA also has the ability to limit the effects of counter battery (CB) fires on partner nations. During Dynamic Front 2018, 1 FAB was utilizing a rapid fire and movement policy in order to minimize the effects of CB. There was an eight minute policy from first rounds to movement of the firing unit which was facilitated largely in part by DF and the ASCA interface. The ASCA interface could rapidly disseminate fire mission data and close the 'sensor to shooter link', this enabled the rapid prosecution of targets and movement of firing assets on the exercise. 1 FAB implemented ASCA at the Brigade level in order to facilitate the coordination of fire support assets despite having a lack of DF with their dismounted observers. In the case of dismounted observers, fire mission data had to be sent to the Battery CP in order to become digital and to be sent to their affiliated Regiment and 1 FAB.

## Requirement for Progressive Training

In April 2017, the Director of Artillery Colonel J.M.A. LaFortune, listed interoperability and digitalization as the second line of effort (LoE) for the RCA. The Director focused on the importance of digitization and interoperability to shorten the 'sensor to shooter link', the EPLRS network and the absolute requirement of a digitized system to facilitate the Precision Guidance Kit (PGK).[33] Further, the Director ordered all Close Support (CS) Regiments to implement live digital training in the summer of 2018 and the implementation of digital training to all DP 1 courses beginning summer 2017 while continuing training for DP2 and DP3 courses.[34] The RCAS has implemented digital fires within all levels of training: DP1 Gunners utilizing the GDS, the DP2 FOO course utilizing the OBS application and the IG and AIG courses conducting exercises with the IFCCS, OBS and FMCA applications in both live and dry training events.

The RCAS has implemented DF training in a three stage digitalization project (denoted in Figure 2). Phase 1 is the functional application of the IFCCS and FSS applications within the CP, the SO application along with the TSM and GDS applications. Phase 2 is the inclusion of the OBS application and the digital transmission of calls for fire (CFF) from the observer to the IFCCS within the CP. Finally, phase 3 will see the inclusion of the FMCA application within the FSCC and the entire digital system sending and receiving information through the EPLRS, CNR-E and SOTM facilitated by CP TOPAZ. The RCAS has had successful implementation of phase 1 as the EPLRS system with its limited range capability is able to transmit data to the gun line however, phase 2 is where the most problems have arisen. Due to the significant requirement of signals personnel to set up the EPLRS communications system, and lack of trained signals personnel within the Combat Training Centre, many of the requests for support are unable to be filled. The lack of trained signals personnel to support DF exercises has led to many exercises reverting back to voice communications and completing their exercises and course aims in a non-digital manner. In order to progress DF training within the RCAS, instructors at the school will require a greater level of support from trained signals personnel on the EPLRS, CNR-E and SOTM capabilities that CP TOPAZ has and will enable.

As DF progress rapidly so do the training requirements needed to ensure that Gunners of the RCA can effectively utilize the new software and equipment. The two courses that can bring the largest commitment to DF training are the IG and AIG courses. The two courses represent a unique opportunity to have future instructors within the school become familiar and proficient in the use of the IFCSS prior to instructing students on courses. Due to the rapid pace of change within the software and procedures of the IFCCS and IFCSS, DF should continue to be embedded within each level of training at the RCAS. Further, if the CA is accepted as a full member within ASCA the current version of the interface would allow training to be conducted on the Artillery Operations - DP2 and the Battery Commander - DP3 courses respectively. This familiarization training will be key to the deployment of proficient FSCC of Divisional Fires Cell personnel on upcoming training events and operations.

## Conclusion

The RCA must continue to develop their DF capability in order to remain relevant within the international community and support future MN missions. DF represent the largest force multiplier and advancement of the artillery of our modern age, the ability to mass fires and effects will continue to be critical for any future mission. Brigadier Neil Sweeney, D Comd of the 2nd Division, Royal Australian Army stated: 'Force multipliers are a critical part of an Army. Digitization delivers information dominance and decision superiority. The COP, providing a Commander with a means to visualize and understand the battlespace delivers that decision superiority'.[35] With the advancements of DF in a MN context the RCA's ability to build a near real-time fires COP and deliver timely and accurate effects within the battlespace is in reach and will enable artillery commanders and manoeuvre commanders to attain information dominance, decision superiority and effect the battlespace quickly with lethal and non-lethal effects.

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# PROCESSUS ET OUTILS NÉCESSAIRE POUR SUPPORTER LE CIBLAGE AU NIVEAU DE BRIGADE AINSI QUE L'ÉCHANGE D'INFORMATION ET LE DÉVELOPPEMENT INITIAL DE LOGICIEL DE CIBLAGE

ADJ M.J.D.R. CHARETTE

LE CIBLAGE EST UN PROCESSUS CONTINU ET CYCLIQUE QUI RELÈVE DU COMMANDEMENT. IL EST MENÉ SIMULTANÉMENT ET IL EST SYNCHRONISÉS AVEC LE PROCESSUS DE PLANIFICATION OPÉRATIONNELLE, L'UN N'EST PAS EFFICACE SANS L'AUTRE. IL A POUR BUT QUE NOUS ENGAGIONS LA BONNE CHOSE, DE LA BONNE FAÇON ET CE AVEC LA SÉLECTION DU MEILLEUR MOYEN, SOIS LÉTAL OU NON LÉTAL POUR ATTEINDRE LES EFFETS DÉSIRÉS. C'EST UN PROCESSUS QUI EST COORDONNÉ PAR LE COMMANDANT DU RÉGIMENT D'APPUI RAPPROCHÉ À LA BRIGADE. LE DÉVELOPPEMENT DES OBJECTIFS DE GRANDE IMPORTANCE, LA LISTE D'OBJECTIFS RENTABLES EST CE QUI FORME LA BASE DE LA MATRICE DIRECTRICE DES EFFETS. LES CONCEPTS D'OPÉRATIONS DE CIBLAGE GUIDENT TOUTES LES ACTIONS OFFENSIVES AU NIVEAU DE LA BRIGADE. LE CONSEIL DE CHOIX DES OBJECTIFS APPROUVE LES CONCEPTS D'OPÉRATIONS DE CIBLAGE, APPROUVE LA LISTE D'OBJECTIFS RENTABLES, LA PRIORITÉ DES CIBLES ET LES CAPACITÉS AFIN D'ATTEINDRE L'EFFET DÉSIRÉ. IL APPROUVE ET RECOMMANDE LES DOSSIERS DE CIBLES, LES APPROBATIONS À PLUS HAUT NIVEAU AU BESOIN ET CONFIRME LES DIRECTIVES DU COMMANDANT.

## Approche

"Pratiquement toutes les perspectives crédibles indiquent que, dans un avenir prévisible, les interventions militaires des nations occidentales continueront de se dérouler dans le monde entier. Il est également évident que pour toute opération majeure, les FAC continueront de déployer leurs troupes dans le cadre d'une alliance ou d'une coalition et ce souvent sans avertissement. En raison de sa régression perçue depuis le conflit en Afghanistan et en raison de sa valeur pour les interventions militaires futures, l'interopérabilité est devenue et restera un domaine clé pour le leadership des FAC. Il existe de nombreux programmes et initiatives de collaboration, par exemple OTAN, ABCA (American, British, Canadian, Australian and New Zealand Armies' Program), des processus et des fonctions du personnel des FAC le sont aussi. Le développement et le maintien de l'interopérabilité est une exigence qui englobe les FAC. La réussite doit être considérée comme une routine faisant partie intégrante de la planification des opérations terrestres. L'interopérabilité est développée dans un contexte commun (y compris les forces d'opérations spéciales, les besoins aériens et maritimes) et est influencé par de nombreux programmes d'interopérabilité multinationaux et par la caractérisation impliquée d'autres armées partenaires. En outre, étant donné que les armées sont complexes, avec des organisations allant de la section à la division et aux corps, le nombre de sujets pour lesquels des exigences d'interopérabilité existent conduira à l'adoption d'une approche progressive pour garantir l'établissement et la réalisation d'objectifs réalistes."[1]

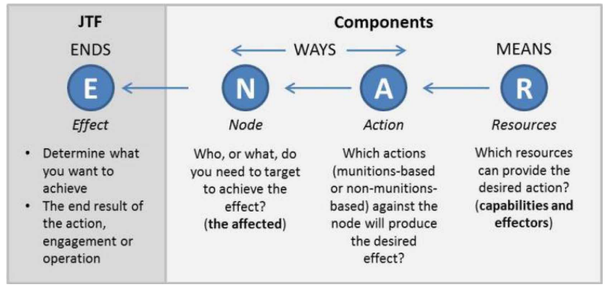
## Discussion

L'objectif principal du ciblage conjoint est de fournir l'utilisation la plus efficace des actifs de la force interarmées et capitaliser sur leurs effets synergiques. Éliminer la duplication des efforts et les fratricides est une partie importante de cette efficacité. De même que l'élimination de la confusion est essentielle pour le défi des fratricides tout en augmentant le rythme opérationnel d'une force interarmées. Le JFC (joint force commander) doit assurer des attaques effectives et efficaces contre les TCT (time-critical target) de haute priorité, ainsi que la prudence nécessaire pour éviter les fratricides et la duplication des efforts. Indépendamment de la menace, une force conjointe doit être capable d'exécuter rapidement des attaques létales et non-létales contre les TCT en utilisant la puissance synergique, tout en considérant que lorsque les composants travaille ensemble, ils ont chacun des responsabilités fonctionnelles et / ou sectorielles qui peuvent se croiser. Chacun doit dépendre et exploiter les capacités des autres pour être décisif dans la bataille. L'application de ces capacités est améliorée grâce à des procédures de ciblage conjointes claires et concises permettant au JFC et aux composants de coordonner rapidement les informations, les opérations et synchroniser les attaques. Des numéros de cible communs, des systèmes de référence et d'images communes de l'espace de combat et le développent des technologies qui prendront en charge les procédures de ciblage de l'avenir.

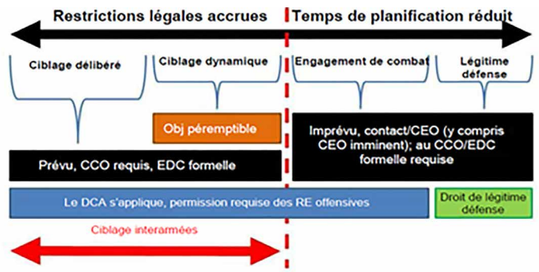
"La définition du ciblage, c'est un processus de sélection, de hiérarchisation des objectifs et de choix du mode de traitement approprié à ces objectifs, en tenant compte des capacités et des besoins opérationnels."[2] Le ciblage est un processus qui se déroule dans l'ensemble du spectre et qui est fondamentalement interarmées. Il est cyclique, flexible et adapté pour répondre aux circonstances qui évoluent de façon dynamique; il vise à obtenir les meilleurs résultats possibles, compte tenu des capacités disponibles, dans un temps minimal. Le but du ciblage est de déterminer ce qui influencera, changera, modifiera ou préviendra une activité ou un comportement de l'adversaire. Un aspect important à retenir est qu'une cible n'est pas l'aspect critique en tant que tel, mais plutôt sa fonction et son importance qui est définie par sa contribution à l'atteinte de l'objectif du commandant. Agir sur les cibles qui influence dans l'espace de bataille, nous créons des effets et des conséquences. Le ciblage relève du commandement de l'intégration des plans, des opérations et du renseignement. Il intègre et synchronise les feux interarmées et les activités d'influence afin de remplir la mission du commandant. Les cibles sont sélectionnées par une évaluation des objectifs militaires, des capacités opérationnelles et des implications légales. Le processus de ciblage attribue le moyen, les capacités adéquates, létales ou non létales à travers lequel l'action est menée. Il est-assez flexible pour des situations allant d'opérations à réaction tactique rapide à des campagnes plus larges. Une cible est une chose physique ou virtuelle qui peut être engagée par une capacité afin de produire un effet nécessaire à l'atteinte des objectifs. En termes pratiques, une cible se décrit comme : un individu, une organisation, un équipement, un bâtiment et une entité virtuelle. La chose n'est pas critique en soi, mais son importance provient de sa relation avec d'autres cibles dans les systèmes opérationnels et / ou sa contribution potentielle à l'atteinte de l'effet désiré.

## Logiciel

Après traduction du livre The Joint Targeting Process and Procedure for Targeting Time-Critical targets, voici ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM (AFATDS). "AFATDS est utilisé par l'armée et les Marine Corps, qui est un système multiservice de logiciel de support de tir qui fonctionne sur le matériel commun de l'armée pour le système de commandement de combat de l'armée ABCS (army battle command system).

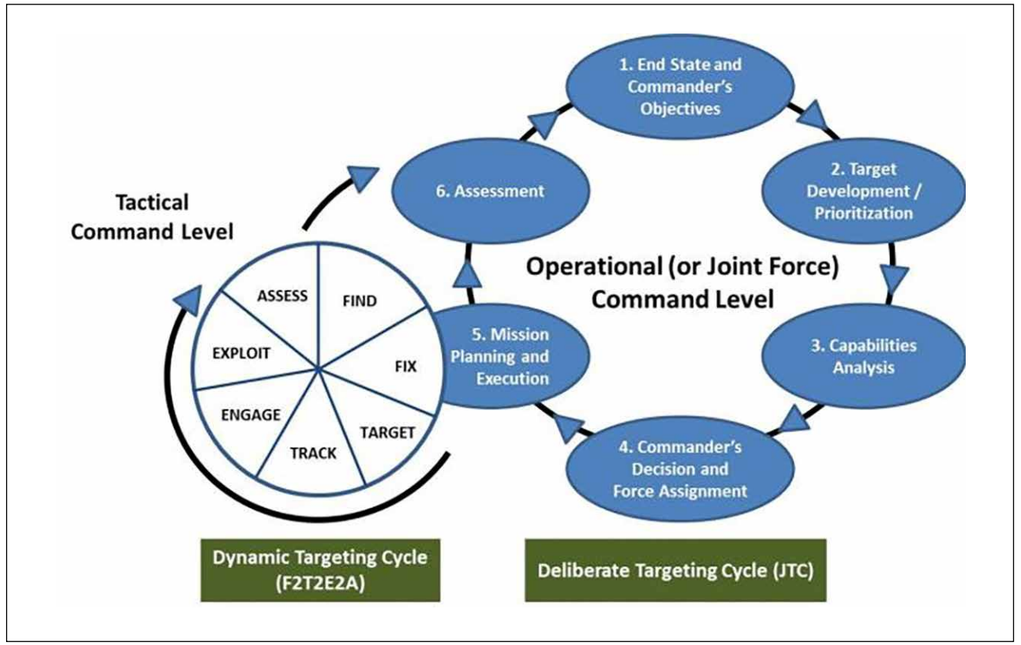



Ciblage basé sur les effets[3]




**Les types de ciblages sont délibérées ou dynamiques et ils incluent l'engagement de :**

- Cibles délibérées (planifiées, hors du cycle de planification)
- Cibles dynamiques (planifiées, dans le cycle de planification)[4]




**Le ciblage n'inclut pas :** Engagement de combat, les effets du ciblage soient directs ou indirects. Les critères sont les autorités d'engagement des objectifs, les règles d'engagement, l'estimation des dommages collatéraux, l'identification positive et le mode de vie.[5]

AFATDS fournit le terrain ou amphibie au commandant de la force avec une capacité robuste, à effectuer une coordination numérique automatique pour toutes les demandes de soutien au tir terrestre / amphibie y compris les missions ATACMS (Army Tactical Missile System), les missions CAS, opérations d'attaque hélicoptères, de tir d'artillerie navale, des missions de tir de canon et mortier. Cette coordination permet au commandant de prioriser automatiquement et engager des cibles dans le meilleur temps possible avec la coordination positive à travers l'espace de combat et ils ont la flexibilité dans l'utilisation des ressources disponibles. Ils peuvent aussi faire la déconfliction d'un autre espace aérien d'opérations. AFATDS priorise plusieurs missions pour assurer que les plus importante missions soient traitées en premier. Il vérifie également les missions de tir entrant contre les MCAF, MCEA et les limites de l'unité et de ses zones de responsabilité. AFATDS informe l'opérateur et demande automatiquement par voie électronique l'autorisation de l'unité qui a établi la mesure de contrôle. Cette unité doit approuver ou refuser la mission avant que le traitement continue."[6]

"AFATDS est équipé d'un écran de sensibilisation de la situation. L'écran est capable d'afficher les FSCM, ACM, les cibles en superpositions, la géométrie du champ de bataille et les communes références du système. Les graphiques peuvent être adaptés en utilisant jusqu'à sept superpositions distinctes. En cliquant sur une cible, un commandant peut examiner toutes les informations sur la mission et la cible et suivre numériquement le statut de chaque mission."[7]

"La version 2 (qui est en développement) comportera un TASM (module de soutien aérien tactique) qui aidera au processus de ciblage conjoint et qui fournira une interopérabilité conjointe. AFATDS TASM facilitera la coordination et la planification quotidienne en fournissant un accès automatisé à l'ATO (air tasking order) du JFACC (joint force air component commander). L'opérateur pourra utiliser les informations de l'ATO pour faire la déconfliction des missions, y compris ceux impliquant ATACMS. AFATDS sera également en mesure de fournir une contribution future, ainsi que d'intégrer des informations de sortie ATO pour éviter les conflits de cible. Les processus TASM cibles proposées par le DOCC (deep operations coordination cell) / FSE (fire support element) / FSCC (fire support coordination center) pour la coordination avec le JAOC (joint air operations center). TASM peut également traiter les cible, les nominations et les envoyer directement dans CTAPS (contingency theater automated Planning System) pour une coordination rapide. TASM a la capacité de permettre à AFATDS de passer numériquement les demandes de soutien CAS (close air support) et AI (air interdiction). Ceci sera un grand progrès avec l'obligation de passer des demandes pour le soutien aérien par la voix. AFATDS peut rapidement coordonner les attaques sur les TCT (time-critical target). Données des renseignements sur les TCT, transmis via ASAS (all source analysis system) à AFATDS au DOCC / FSE / FSCC. AFATDS vérifie automatiquement les TCT avec la liste cible des gains élevés et conduit appariement armecible. AFATDS s'affiche pour les opérateurs DOCC / FSE / FSCC si la cible qui viole toute coordination des mesures mis en place ou des mesures de contrôle de l'espace aérien. Si la cible viole une FSCM et ACM, l'opérateur reçoit un voyant d'alarme orange sur sa fenêtre d'intervention, ce qui signifie que la coordination doit prendre place. L'opérateur fera OK demande de mission, envoi automatique de message pour la coordination. Le BCD (battlefield coordination détachement) coordonne avec le JAOC (joint air opérations center), puis le BCD approuve ou refuse la demande. Finalement, AFATDS fournira une décision tactique et globale du soutien au tir du système de support automatisé."[8]

Après traduction du livre The Joint Targeting Process and Procedure for Targeting Time-Critical targets, voici ADOCS. "AUTOMATED DEEP OPERATIONS COORDINATION SYSTEM (ADOCS) est un système développé par le Agence de projets et de recherche avancée (ARPA) dans les essais sur le terrain et l'utilisation par l'armée américaine. Les fonctions d'ADOCS sont une coordination, une planification et une exécution de bases de données (pour inclure le ciblage, les routes, les points de contrôle aérien et la synchronisation de la bataille). Un affichage de graphiques situationnels tels que des ordres de bataille et des menaces, les manœuvre amis et des unités d'artillerie, les lignes de phase, les engagements de zones, les RFAs et les TAIs. L'affichage de la coordination et l'état d'exécution des missions, une interface conjointe avec AFATDs, effectuer des opérations de ciblage, exercer le contrôle et les procédures d'alerte, coordonner la planification de l'aviation et les mesures de contrôle de l'espace aérien, collecter des données sur les cibles sélectionnées, fournir des rapports de mission, y compris les missions ATACMS et les listes de cibles." [9]

## Conclusion

Le ciblage est produit à tous les niveaux de commandement au sein d'une force conjointe et est effectuée à tous les niveaux par des forces qui sont capables de la livraison du tir ou d'attaquer des cibles à la fois létal et non létal et ce de façon perturbateur et ou destructeur. Le ciblage est une fonction partagée par les opérations et les renseignements. Cependant, les exigences de la déconfliction et les efforts pour atténuer la duplication d'effort au sein de la même force. Synchroniser les attaques de ces cibles avec d'autres composants des forces interarmées est ce qui complique grandement le cycle de ciblage. Et c'est pourquoi, un cycle de ciblage conjoint et efficace est essentiel pour le JFC et les autres composantes afin de planifier et d'exécuter des opérations conjointes. Le ciblage conjoint peut être décrit comme le processus de sélection des cibles dans un domaine opérationnel du JFC et correspondant à une réponse appropriées des composantes et ce compte tenu des exigences opérationnelles et des capacités disponible. Le ciblage conjoint est caractérisé par l'intégration et la coordination des armées de terres, de la mer, de l'air et des opérations spéciales dans le cycle de détection et d›engagement des cibles.

Comme nous avons appris des expériences dans des endroits tels que l'Afghanistan en ce qui concerne notre capacité à engager des objectifs urgents en temps opportun et de manière efficace. Est que ceci est une condition requise pour des opérations militaires réussies. Et que nos forces sont confrontées à une menace toujours croissante des adversaires qui posent ou pourrait poser un danger direct et exiger une réponse militaire immédiate. La complexité des engagements de cibles sensibles au temps, exige des commandants de la force interarmées et à leur personnel à apprécier pleinement la coordination et l'intégration et qui est primordiale pour minimiser les risques de fratricides et d'autres effets collatéraux lors des engagements. Et c'est pourquoi je crois que nous devrions continuer le développement mais toujours en gardant à l'idée ce que nos alliées font les doctrines que nous utilisons ou elles sont fortement inspirer de nos alliées pour le ciblage. Nos interventions militaires continueront de se dérouler dans le monde entier et il est également évident que pour toute opération majeure, les FAC continueront de déployer leurs troupes dans le cadre d'une alliance ou d'une coalition.

### Notes en fin de page

[1] Juneau, Major-General J.C.G. "Directive du CMDTA de l'AC Interopérabilité de l'Armée Canadienne", 2016

[2] Canadian Forces Joint Publication 3-9, Targeting, B-GJ-005-309/FP-001, 2014, p. 11

[3] Ibid, p. 48

[4] Ibid, p. 17

[5] Ibid, p. 61

[6] WILLIAM W. HARTZOG, General, USA Commander Training and Doctrine Command, PAUL K. VAN RIPER, Lieutenant General, USMC Commanding General Marine Corps Combat Development Command, MICHAEL L. BOWMAN, Rear Admiral, USN Commander Naval Doctrine Command, JOHN P. JUMPER Lt Gen, USAF DCS/Plans and Operations, *The Joint Process and Procedure for Targeting Time-Critical Targets 1997, p.68*

[7] Ibid, p68

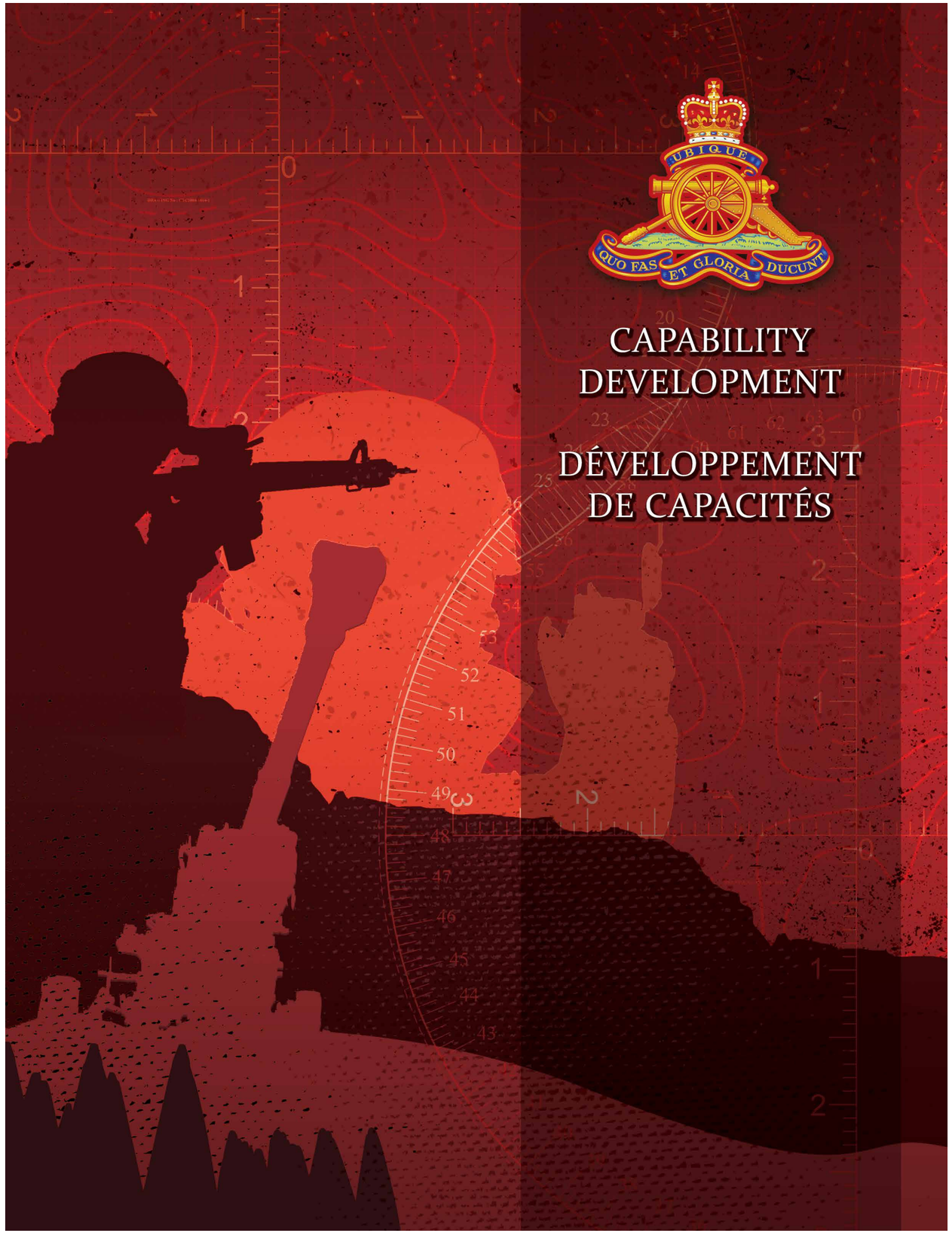
[8] Ibid, p. 69

[9] Ibid, p. 70





THE LONG COURSE – JOURNAL – D'ENSEIGNEMENT ÉLANCÉ




# CAPABILITY DEVELOPMENT

# DÉVELOPPEMENT DE CAPACITÉS

# TOWARD A NEW GROUND-BASED AIR DEFENCE CAPABILITY FOR THE CANADIAN ARMY:

## *A Consideration of Available Systems*

CAPT A.J.D. COGSWELL

THE CANADIAN ARMY'S (CA) RENEWED COMMITMENT TO AIR DEFENCE AND ACQUIRING A NEW GROUND-BASED AIR DEFENCE (GBAD) SYSTEM IS ENCOURAGING AND NECESSARY CONSIDERING THE RETURN TO A FOCUS ON WARFIGHTING AGAINST A NEAR-PEER OR PEER-PLUS ADVERSARY. THE CAPABILITIES AND THREATS OBSERVED IN THE CONFLICT IN UKRAINE AND ELSEWHERE SHOW UNEQUIVOCALLY THAT CEDING CONTROL OF THE AIR TO AN ADVERSARY PUTS A MANEUVER FORCE AT A SEVERE DISADVANTAGE. WHILE PASSIVE AIR DEFENCE MEASURES CONTINUE TO APPLY, THE NEED FOR AN ACTIVE SHIELD TO PREVENT INTERFERENCE WITH OPERATIONS FROM THE AIR IS EVIDENT. A NEW SYSTEM TO BE FIELDED BY THE ROYAL REGIMENT OF CANADIAN ARTILLERY (RCA) MUST, IN ACCORDANCE WITH HIGH LEVEL MANDATORY REQUIREMENTS (HLMRS) DEFINED BY CANADIAN ARMY LAND WARFARE CENTRE (CALWC), HAVE SUFFICIENT LETHALITY TO COUNTER THE THREAT OF AUTONOMOUS AERIAL SYSTEMS AND MUNITIONS; INTEROPERABLE WITH ALLIES AND COALITION PARTNERS AS PART OF A GREATER INTEGRATED AIR DEFENCE SYSTEM (IADS), PROVIDE AWARENESS IN THE FORM OF A COLLATED RECOGNIZED AIR PICTURE (RAP) FROM AVAILABLE SENSORS; ROBUST ENOUGH TO SUSTAIN OPERATIONS IN AUSTERE, INHOSPITABLE CONDITIONS; AND FLEXIBLE ENOUGH TO SUPPORT THE VARIED KINDS OF POTENTIAL OPERATIONAL DEPLOYMENTS, IN CANADA AND OVERSEAS. CONSIDERING THE AVAILABILITY OF SYSTEMS AND THE CURRENT STATE OF TECHNOLOGY, IT IS RECOMMENDED THAT THE CA ACQUIRE A MIX OF VERY SHORT RANGE AIR DEFENCE (VSHORAD) AND SHORT RANGE AIR DEFENCE (SHORAD) SYSTEMS TO PROTECT MANEUVER FORCES.

### Introduction

Everything old is new again. Having spent the better part of the past ten to fifteen years divesting its air defence capability, the CA is in the process of acquiring a ground-based air defence (GBAD) system for the Canadian Army (CA), to be fielded by the Royal Regiment of Canadian Artillery (RCA). The reasons for abandoning an air defence capability were grounded in the CA's experience in Afghanistan, where the enemy air threat was non-existent and NATO enjoyed air supremacy. Deploying an air defence capability to Afghanistan, less the Airspace Coordination Centres following several air-to-ground blue-on-blue incidents such as Tarnak Farm, was redundant considering the nature of that conflict. However, an assumption was made about the broader nature of conflict in the 21st Century, based on the Afghanistan experience, that this was the model of conflicts to come: a counter-insurgency fight against an asymmetric, technologically unsophisticated enemy. Like most conclusions drawn from a sample size of one, it turned out to be completely erroneous, as the situation in the Ukraine and Eastern Europe highlights unequivocally today.

Instead of fading away, air defence is top-of-mind for senior leadership in the CAF today, especially those who are considering and planning for the prospect of leading troops in Eastern Europe under the shadow of a renewed Russian threat, including a considerable air threat. While air defence is still treated as a red-headed step-child within the RCA, CA maneuver formation commanders pose the question, time and time again, 'What do you mean, we have no air defence!?' Due to pressure exerted mostly from without the RCA, a push to acquire a new, relevant air defence capability is currently underway at the Directorate of Land Requirements (DLR), and has been identified by the Minister of National Defence (MND) and the Chief of the Defence Staff (CDS) as one of the top procurement priorities for the CAF and CA.[1] To that end, DLR has begun a procurement process driven by an Urgent Operational Requirement (UOR).

However, where the CA's air defence capability has been almost wholly divested and the last remaining air defence unit, 4 Air Defence Regiment (4 AD Regt) has been transformed into a composite Surveillance and Target Acquisition regiment, 4th Artillery Regiment (General Support) (4 Regt (GS)), it is no longer a question of merely acquiring a weapon system to put in the hands of air defenders. Rather, the CA finds itself in the position of having to re-establish an air defence capability, comprising weapon systems and associated enablers (C2 systems, air surveillance systems, etc.); doctrine and tactics, techniques, and procedures (TTPs); a training plan; and personnel to field the system. This is a significant challenge to be undertaken but, on the bright side, the current situation with regard to the threat from the air and available defence is in flux. It is, as it turns out, an opportune time to go shopping for air defence systems because an evolution is underway, in response to the changing air threat, especially unmanned aerial systems (UAS).[2]

As has been seen during the conflict in the Ukraine, UAS pose a significant threat to ground forces when used to cue long range strike assets. As an airborne sensor, UAS are able to acquire targets precisely over a large area with their powerful optics payloads. Russian-backed forces were able to achieve devastating effects against Ukrainian maneuver forces and artillery units by using rocket artillery to strike targets acquired by UAS with a short sensor-to-shooter link. The instance of an entire Ukrainian mechanized infantry battalion being destroyed by rocket fire is well understood and demonstrative of the new danger posed by these aerial systems. Because UAS present a much smaller radar cross-section and produce fainter heat signatures, they are difficult targets for older, established air defence systems to engage that rely on radar fire control and infrared (IR) guidance.

Not only is the threat from newer UAS greater, but also the threat posed by conventional air-breathing aircraft due to the increased precision, lethality, and stand-off of contemporary air-to-ground weapons. The ranges of newer munitions, both of rockets and conventional artillery, is ever-increasing, not to mention improved generations of cruise missiles (CM) and tactical ballistic missiles (TBM).[3] The line of weapons release for aircraft-borne munitions is getting further and further from the intended target in order to lessen the risk to these expensive and vulnerable platforms. Therefore, the current emphasis in air defence against conventional aircraft is no longer to defeat the weapon platform but rather the munition itself.[4] Taking these two factors into account, the CA and DLR have limited the scope of the threat which the new GBAD system will have to defend against and have determined that a system capable of counter-UAS (CUAS) and counter-rockets, artillery, and mortar (CRAM) is required.

### Methodology

This study will consider the current capability gap in the CA with regard to GBAD, discuss the current air threat, note the restraints and constraints imposed upon the current procurement project, review available GBAD systems, and recommend a system or systems for procurement. Policy documents, including *Strong, Secure, Engaged: Canada's Defence Policy* and *Close Engagement: Land Power in an Age of Uncertainty*, will be discussed in order to provide context and understand what the vision for the CAF and CA will be in the coming years. Relevant DLR documents related to the current procurement project will provide criteria as well as the arcs limiting the scope of the field of potential GBAD systems. Finally, technical data on various GBAD systems will be presented, discussed, and weighed against selection criteria and a recommendation made as to which system, or systems, to acquire.

### Review of Literature and Sources

In *Strong, Secure, Engaged: Canada's Defence Policy*, the Government of Canada (GoC) sets out its vision of the nature and setting of future conflicts into which the CAF could deploy, the tasks required to be performed in Canada and abroad by the CAF, and force structure and capabilities required for the CA to successfully accomplish tasks in future conflicts. Boiled down, the vision presented is of a CA that is "agile, scalable, and responsive" that is based on the mechanized brigade group. Because it is the lowest level of tactical formation that is able to integrate and coordinate joint effects and conduct joint operations, the mechanized brigade group is considered the foundation of future expeditionary deployments, which could be scaled from a single individual up to the entire brigade group.

In order to enable the CA and its brigade groups to successfully operate in future conflict zones, the GoC, in *Strong, Secure, Engaged*, has committed to modernizing vehicle fleets for the CA, including logistics vehicle fleets as well as light armoured vehicles. As well, the commitment has been made to invest in "war-fighting capabilities, such as ground-based air defence systems … and associated munitions capable of protecting all land-based force elements from enemy airborne weapons."[5] This is a broad commitment considering the evolving nature of the threat from the

air resulting from rapid technological development and the fact that the CA's only air defence capability is the C6 general purpose machine gun (GPMG) in the all-arms air defence (AAAD) mode. Suffice to say, in order to meet the vision presented in *Strong, Secure, Engaged* a GBAD system will have to be scalable in order to be force-packaged down to combat team or even platoon level and up to brigade group, depending on the specific requirements of a potential deployment. Considering the evolving air threat—especially that posed by inexpensive, widely available, off-the-shelf UAS, and the resultant risk to even small groupings of CA soldiers—it is anticipated that air defence will be required at lower levels than previous, Cold War experience indicated. As well, any system acquired will have to be robust and capable of operation in the Arctic and the severe meteorological conditions extant there. Further, any such system must be fully interoperable "to ensure seamless cooperation with allies and partners, particularly NATO."[6]

*Close Engagement: Land Power in an Age of Uncertainty* is the CA's description of "how land power will be employed to meet strategic aims" and specifically "how the Canadian Army should be configured, equipped and trained in the amedium term."[7] The threat identified in *Close Engagement* is the same as that identified in *Strong, Secure, Engaged*, which is a sophisticated, dynamic state or non-state actor that will seek to subvert and disrupt by using various military and non-military means, and leveraging increased information operations and influence activities. On the battlefield, the adversary will bring various effects, both lethal and non-lethal, to bear against CA personnel, seeking to achieve standoff in order to increase survivability and employing autonomous systems, such as UAS, to increase effectiveness and lethality of conventional systems, such as rocket artillery. The environment in which future conflict will take place, or the Future Land Operating Environment (FLOE), "will be complex, dynamic, volatile, and highly uncertain," and "battlespaces will be increasingly contested."[8]

Principles which underpin the concept of *Close Engagement* include "combat-effective, multi-purpose land forces" that will provide the GoC with an agile, flexible response to emerging conflicts of unpredictable nature. The CA will continue to be an expeditionary force to be deployed overseas on operations, as well as responding to domestic situations at home in Canada. In the context of overseas operational deployments, "the [CA] will … act as part of an alliance or multinational coalition" and its structure will be based, as described in *Strong, Secure, Engaged*, "on deployable formations (brigade groups and a division HQ) … [ensuring] the [CA] is interoperable with other CAF capabilities, allies and coalition partners … [in order to] synchronize joint effects."[9] So it is anticipated that the CA's next major overseas deployment on operations will take place in an uncertain environment where the scale and nature of the conflict could escalate rapidly and take on various aspects. In order to deal with the threats and uncertainty associated with rapid technological advancement, increasingly lethal weapon systems, the proliferation of advanced weapons among state and non-state actors the CA seeks to force generate "scalable, self-sufficient force packages capable of full-spectrum operations" that are able to "understand and adjust to the changing conditions [of a conflict] faster than adversaries."[10] Versatility, adaptability, and shared understanding are key concepts in this effort.

This concept envisions a Canadian Mechanized Brigade Group (CMBG) headquarters commanding a formation that is connected to share real-time information and allow access to resources and force multipliers at lower levels; that is agile in its decision-making, with greater operational and tactical mobility, and able to "transition between small task-oriented force elements and larger combined arms groupings"[11]; that is flexible and resilient; that is better integrated to achieve cooperation with non-military actors, e.g. media agencies and NGOs; and that is robust and prepared to conduct combat operations.[12] CMBGs will be commanded by "a mobile, protected core HQ."[13] A key element of the CMBG's protection will be a credible and capable air defence system. This formation, its HQ, and enablers will be required to be rapidly transportable by both air and sea into theatre and must have a high level of mobility on the ground. Of course, operating under austere conditions continues to be a requirement. The new air defence system will be required to operate to these specifications within a CMBG and "to defend deployed forces against fast attack aircraft, armed helicopters, ballistic missiles, and small, low altitude, potentially swarming [UAS]."[14]

In its *Capability Development Record 4.1.0*, CALWC Designs synthesizes the policy statements in *Strong, Secure, Engaged* and *Close Engagement*, evaluates the current air defence deficiency in the CA, considers the future security environment and the threat, conducts a risk analysis, catalogues interdependencies, and generates recommendations based on DLR's initial list of High Level Mandatory Requirements (HLMRs) to guide the procurement process. As a document, it breaks down the intent expressed generally in *Strong, Secure, Engaged* and *Close Engagement* to acquire a GBAD capability to defend all land force elements from the existing, complex air threat and chunks up the problem into manageable, defined subcomponents.

Related to land force elements, it is asserted that the new GBAD capability should "focus on expeditionary over domestic operations"[15] because GBAD capable of defending maneuver forces in theatre is presumed to be able to scale down to defend domestic events, such as international diplomatic meetings. Considering air threat capabilities, it is recommended that a new GBAD system must be able to defeat munitions vice their delivery platforms because of the increased ranges of air-to-ground muntitions. Therefore, the new GBAD system will require CRAM capability. In that regard, the threat to be countered has been refined in this document and has been rendered down to something considered manageable: UAS, except Class III High and Medium Altitude Long Endurance (HALE/MALE) and Class I micro UAS; and rockets, artillery, mortars (RAM). Defence against ballistic missiles exceeds current program resources and should be considered at a later time.

The key considerations identified by the *CDR 4.1.0* with regard to GBAD capability in the CA are interoperability, scalability, and modularity.[16] Any GBAD system must "function within existing and projected CAF communications and information systems, including command support and aerospace control systems."[17] The system must be able to receive information from various sensors in the battlespace, forward that information to command posts and, ultimately, fire control units for target engagement in time to defend forces on the ground, and generate a real-time Recognized Air Picture (RAP) to feed into and inform the Common Operating Picture (COP) at the revelvant HQ. Regarding scalability, a GBAD capability must be able to be task-tailored based on the threat, the size and nature of the forces requiring protection, and their task and operational posture. It must be able to support the small independent team up to the joint task force. One system, it is recognized, will not be able to provide all the protection required to counter the existing air threat so the CA's GBAD capability must be modular in order to "protect our forces and installations from as many threats as possible [and] the initial capability must integrate future Command, Sense, or Act capabilities."[18] It is anticipated that the GBAD capability will grow, incorporating new components as they are acquired rather than starting from scratch each time. As the document highlights, "this concept envisions CA [GBAD] as a component element(s) of a larger joint and/or coalition integrated air and missile defence system (IAMDS) that contributes to friendly force air defence and C-RAM. To this end, CA's GBAD capability must address the following considerations: mass, mix, movement, maneuver, agility, integration, mutual support, early engagement, defence in depth, all-round defence, and resilience."[19]

As previously stated, everything old is new again, and this holds true for doctrine as for everything else. The enumerated list from the *CDR 4.1.0* referenced above, is developed from the CA's *Air Defence Artillery Doctrine*. Though almost twenty years old now, the doctrine set out in this CA publication is still relevant, as evidenced by the CALWC study above. Specifically, the Principles of Employment and Principles of Deployment of air defence have been elaborated and updated to inform the current procurement process. Compared with the above list of considerations set out by CALWC, the principles remain relatively intact considering the contemporary threat and technological developments. In order to optimize the defence afforded by an air defence system, commanders apply the Principles of Employment: Mass, Mix, Mobility, and Integration. For an effective defence, air defence is deployed in keeping with the Principles of Deployment: Mutual Support, All-Round Defence, Weighted Coverage, Early Engagement, and Defence in Depth. In the discussion, this doctrine will be referenced in order to provide further context for evaluating which GBAD system(s) meet the established requirements.

**Discussion**

An examination of potential GBAD systems to meet the CA's needs, based on the constraints and limitations described above, especially those enumerated in the *CDR 4.1.0*, is required at this point. Before launching into that, a summary of selection criteria is needed to limit the search. To this end, certain HLMRs set out in the *CDR 4.1.0* will be adopted: Lethality, Interoperability, Awareness, Robustness, Flexibility, and Sustainability. (The HLMRs Training and Responsiveness will not be addressed in this discussion in order to limit the scope to manageable arcs. Similarly, Interoperability, and Awareness will be referenced but this examination lacks sufficient technical data to make definite pronouncements on these aspects.) Therefore, the CA requires a GBAD system of sufficient lethality, capable of defending against UAS (excluding MALE/HALE and micro-UAS) as well as RAM. It must integrate with current CA communications and information management systems, specifically it must interface with sensors, including the ELM 20/84 Multi-Role Radar (MRR) and the Light Counter-Mortar Radar (LCMR), which is capable of air surveillance. Further, it must be capable of integrating with NATO allies and coalition partners as part of an IADS in theatre. It must be robust and capable of operating in austere environments, including the Arctic. Finally, it must be extensible and have capacity for adaptation, upgrading, and expansion as technology advances and new threats emerge.

Systems selected for consideration have been selected based on country of origin (Russian and Chinese systems have been excluded for obvious reasons) and based on possessing at least a CUAS or CRAM capability. Systems, such as Patriot and THAAD have not been considered in favour of very short range air

defence (VSHORAD) and short range air defence (SHORAD) systems.

It should be noted that there are several systems currently in development that show promise as CRAM and CUAS air defence systems, including the Low Cost Interceptor (LCI), Extended Area Protection and Survivability (EAPS) and Talon, all being developed by the US, as well as the Rheinmetal Laser Air Defence System (RLADS) from Germany. It appears that directed energy weapons development is on a cusp, and the deployment of an operational system is close at hand. This kind of capability bears close investigation to determine future suitability for the protection needs of the CA.

**FIM-92 Stinger**

The Stinger man-portable air defence system (MANPADS) is a shoulder-launched surface-to-air missile developed for the US Army during the 1970s. It achieved some notoriety in the hands of the *Mujahideen* in Afghanistan during their war with the Soviets. It proved to be a robust and simple system, capable of engaging threat aircraft, especially Mi-24 HIND attack helicopters, with its IR seeker and high explosive (HE) blast fragmentation warhead. The ordnance has a max effective range estimated at 4.8 km, up to an altitude of 3800m. It is proven technology and is widely available, being fielded by many nations. Currently, in an effort to modernize the weapon system, the FIM-92J Stinger has been developed and is undergoing testing in order to determine its ability to engage and neutralize UAS. Successful engagements have been achieved and over the next two years in will enter service with the US Army and USMC.[20]

The FIM-92J Stinger is worthy of consideration for acquisition because of its proven track record and because it is used by many of our NATO allies and likely coalition partners. It would provide the CA with a MANPADS capability that has been lacking for many years. The benefits of acquiring such a system are that it need not be fielded exclusively by gunners of the RCA; this is a weapon system that could be distributed to maneuver forces and Combat Service Support (CSS) personnel to defend various tactical positions and installations. The effect on morale should not be underestimated when considering the current air threat, especially that posed by UAS. Arming maneuver forces with a capable weapon system to defend themselves effectively from UAS bolsters morale and prevents the helpless feeling that sets in when a hostile UAS is observed orbiting one's position. The Stinger would fill a need that even renewed commitment to AAAD training likely would not satisfy.

Considering the selection criteria, how does the Stinger stand up? With regards to lethality, Stinger meets the requirement for CUAS, but falls short on CRAM. Interoperability with NATO and coalition partners is positive because, despite the fact that Stinger does not interact with C4ISR systems in the same way other GBAD systems do, ammunition supply should not be an issue considering the number of users. It comprises Identify Friend/Foe (IFF) capability to increase to operator's awareness. The system is robust and proven in various operational environments. And finally, Stinger is a very flexible system and can be scaled up or down easily, being limited only by the availability of trained personnel.

**SLAMRAAM**

Keeping with the theme of modernizing older weapon systems, consider the Surface-Launched Medium Range Air-to-Air Missile (SLAMRAAM). Designed to replace the US Army's fleets of Avengers and fulfill the SHORAD role at formation level, the SLAMRAAM is a vehicle-mounted system and fires the AIM-120C-5 surface-to-air missile, which has a range of 25 km and max altitude of 4000m. The improved AIM-120C-5 is more agile than its predecessors and able to engage UAS and cruise missiles (CMs). The system is agile, the US version being mounted on a HUMVEE chassis, and versatile. Its strategic mobility and tactical mobility should be rated as relatively high because it can be easily airlifted or transported by ship and its tactical mobility is limited only by the type of chassis on which it is mounted. It possesses some lethality against UAS and CMs, but no CRAM capability. However, despite successful testing and orders for delivery, the SLAMRAAM project was cancelled in budget cutting efforts in the US in 2008-09, and none have been fielded. The status of the project is unclear at this time and, as such, it is a dubious candidate at best, unless the situation changes with the US Army.[21]

**Iron Dome**

Iron Dome is an all-weather CRAM system produced by Israel that can defend an area of 150 square km.[22] Each Iron Dome battery consists of one ELM 20/84 MRR, which Canada has purchased, a command and control centre, and three fire units, each packing 20 Tamir missiles. The missiles have been successfully tested against RAM targets and is currently operational in Israel, with development on-going there and in the United States. Iron Dome is one component of Israel's air defence which focuses on short range threats. The Tamir missile has a maximum range out to 40 km and is 3 m in length, weighing 90 kg at the launcher. The MRR is capable of tracking multiple targets and discriminating between benign and dangerous targets likely to hit defended areas. Engagements are reportedly achievable in seconds, including detection time.[23]

While presenting a robust CRAM capability, Iron Dome's usefulness as a CUAS system is unknown at this time. As well, the mobility of the system and its ability to operate in cold weather environments such as the Arctic would have to be ascertained before any move to acquire it were made. However, the CA has already purchased and is receiving MRRs that comprise part of the Iron Dome system, so awareness is an upside for the Iron Dome. Similarly, it appears that Iron Dome will be proliferated at least to the US, indicating that the prospect of interoperability is good.

**BAMSE**

Developed by SAAB Bofors Dynamics in Sweden, the BMASE is an all-weather air defence system capable of engaging fixed- and rotarty-wing aircraft, anti-radiation missiles, cruise missiles, guided bombs, and UAS. Up to 1500 square km can be defended by one BAMSE battery, comprising one Surveillance Coordination Centre and three Missile Control Centres that include six missiles and a fire control radar. The missiles are 2.6 m in length, weighing 85 kg at launch and have a maximum range of 20 km up to 15000m in altitude. It is currently listed as in production but not in service because the program under which it was developed was cancelled by Sweden in 2008 as part of wider cost reduction measures.[24]

The BAMSE lacks the CRAM capability required for acquisition of a new air defence system and was developed during the late 1990s. Though several purchasers had experessed interest in acquiring the system, none have been delivered and they remain in storage. Though it is presumably a robust system that would have no trouble operating in cold weather, interoperability is a concern at this time.

**Spyder ADS**

Developed by Rafael Advanced Defence Systesm of Israel, the Spyder Air Defence System is reportedly similar to the US SLAMRAAM. It is a "low-level, quick-reaction SAM system, designed to be capable of engaging aircraft, helicopters, UAVs, UCAVs and precision-guided munitions (PGMs). It provides protection to high-value areas, as well as ... forces located in the combat area."[25] It is unique in that it mounts two different missiles on the fire unit, the upgraded Derby and Python 5 missiles, however the effective ranges of these are unknown. A battery of Spyder ADS consists of a command and control element and six fire units. Mobility is dependent on the vehicle chassis mounting the system. It is compatible with the MRR and therefore provides ample awareness to operators. Flexibility should not be a concern as it seems to be scalable for task-tailored deployments but, as with the Iron Dome, its robustness with regard to cold weather climate must be ascertained.[26]

**Conclusion**

The CA's renewed commitment to air defence and acquiring a new GBAD system is encouraging and necessary considering the return to a focus on warfighting against a near-peer or peer-plus adversary. The capabilities and threats observed in the conflict in Ukraine and elsewhere show unequivocally that ceding control of the air to an adversary puts a maneuver at a severe disadvantage. While passive air defence measures continue to apply, the need for an active shield to prevent interference with operations from the air is evident. A new system to be fielded by the RCA must, in accordance with HMLRs defined by CALWC, have sufficient lethality to counter the threat of autonomous aerial systems

**Recommendation**

| System | Lethality | Intero perability | Awareness | Robustness | Flexibility |
|---|---|---|---|---|---|
| FIM-92J Stinger | | | | | |
| SLAMRAAM | | | | | |
| Iron Dome | | | | | |
| BAMSE | | | | | |
| Spyder | | | | | |

Meets criteria
Caution, further analysis required
Does not meet criteria

The recommendation of this paper is that, considering the HLMRs defined by CALWC, the CA should acquire a mix of systems, in keeping with our doctrinal Principles of Employment of Air Defence. Specifically, the CA should acquire FIM-92J Stinger MANPADS for VSHORAD defence of maneuver units, HQs, logistics nodes and key installations. As well, considering awareness and interoperability, the CA should also acquire Iron Dome and Spyder ADS for SHORAD and CRAM defence, which would form a robust, integrated, and mixed air defence system based on the ELM 20/84 MRR, which is already in the inventory. This configuration would allow maneuver commanders to mass defensive fires to protect their forces and enable battlefield mobility. It would present a layered system of defence and would better enable the CA to prevent future adversaries from interfering with our ground operations from the air, thus meeting the aim of air defence.

and munitions, interoperable with allies and coalition partners as part of a greater IADS, provide awareness in the form of a collated RAP from available sensors, robust enough to sustain operations in austere, inhospitable conditions, and flexible enough to support the varied kinds of potential operational deployments, in Canada and overseas. Considering the availability of systems and the current state of technology, it is recommended that the CA acquire a mix of VSHORAD and SHORAD systems to protect maneuver forces.

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# PLAN IT RIGHT OR REGRET IT

## *A Glance at Procurement as Part of Capability Development*

CAPT D.P. WILSON

CANADA'S DEFENCE POLICY, STRONG, SECURED, ENGAGED (SSE), OUTLINES THE GOVERNMENT OF CANADA'S VISION OF LONG-TERM INVESTMENTS TO MODERNIZE THE CANADIAN ARMED FORCES' (CAF) CAPACITY TO SUPPORT PEACE AND SECURITY WITH A GROWTH OF DEFENCE SPENDING OVER 10 YEARS FROM $17.1 BILLION IN 2016-17 TO $24.6 BILLION IN 2026-27.[1] THESE INITIATIVES, THE RESULT OF AN EXTENSIVE DEFENCE POLICY REVIEW, ARE UNDERSCORED BY INVESTMENTS IN PEOPLE, TRAINING, AND EQUIPMENT WHICH SPAN THE BREADTH OF CAF MISSION SETS. SSE PROVIDES STRATEGIC DIRECTION TO ENABLE THE PROCESS OF CAPABILITY DEVELOPMENT BY SUPPORTING THE CREATION OF NEW CAPABILITY CONCEPTS TO ADDRESS CHALLENGES IN THE 21ST CENTURY BATTLESPACE, AS WELL AS PROVIDING FOR THE REVITALIZATION AND MODERNIZATION OF THE EXISTING DEFENCE INVENTORY.

Capability development is vital to maintaining an agile military that is capable of mounting domestic or expeditionary operations. To operate in a security environment which is characterized by growing complexity, grey zone and hybrid warfare, as well as inter- and intra-state conflict, the army must possess long-term vision in anticipating future needs. To achieve this, Army Capability development is a four pillar process called Capability Based Planning (CBP) which involves the pillars of ***Conceive***, ***Design***, ***Build***, and ***Manage*** that culminate in the creation of capabilities to enable the war fighter. This process is far more complex than simply selecting equipment and putting it into service because broad organizational impacts must always be considered.

CBP works to generate a broad spectrum of capabilities, beyond the simple addition of new pieces of kit to the inventory. Capabilities represent the ability of the military to perform certain tasks and are composed of four elements – ***People, Process, Equipment*** and ***Training***. Without all four of these elements, a military does not possess a capability. First and foremost, people is the mainstay element as the army must plan to have sufficient personnel to use, operate, maintain, and teach future operators while maintaining approved personnel numbers. Second, is process, which consists of doctrine, procedures and regulation, which enables the capability to be employed effectively and successfully. Third, is the equipment itself which provides the tool, be it physical or cyber, to accomplish a task. A river crossing capability may require trucks, pioneer tools, and a bridge layer, for example. Finally, is the training which includes the institutional capacity to teach not only how to operate the capability, but sustain and maintain it. Wrapping it up, CBP is the process that takes strategic direction and determines investments and divestments that must be made to the CAF capability portfolio.[2]

How does capability development fit within the Conceive, Design, Build and Manage framework?

CBP begins in the *Conceive* stage where conceptual ideas are developed. The objective of the ***Conceive*** pillar is to state an identified capability requirement or deficiency, and to conduct a preliminary analysis to understand capability goals and explore interdependencies.[3] For the army, this phase is led by the Canadian Army Land Warfare Centre (CALWC).

CALWC is the army's futures organization and it anticipates the army's future needs to conduct operations based on predictive models and research. The growth of a future threat model that includes artificial intelligence, robotics, advanced computing, and nanotechnology, creates technologically driven societal change which results in an incredibly complex operating picture for the army. [4] As a result, they publish capstone documentation such as ***Close Engagement*** (in draft) which outlines the aspirational operating concept of the army - how the Canadian Army intends to apply the objectives of ***SSE*** in the future battlespace. The ***Conceive*** space of CBP uses this operating concept as guidance to conceptualize how the army intends to do its business and determine its future requirements.

During conception, CBP identifies

where the army lacks sufficient capabilities to achieve the sought outcomes of the capstone document. This capability gap is expressed in a Statement of Capability Deficiency (SOCD). Just as a tactical commander must define the problem and conduct an estimate to determine the relevant factors and deductions, CBP does the same at a strategic level for capabilities.

Having identified that there is a capability gap, initial high level mandatory requirements (HLMRs) can be produced through consultation with stakeholders, such as the Royal Regiment of Canadian Artillery, which explains, in broad terms, what would need to be achieved by this conceptual capability. The operational functions of the army – Command, Sense, Act, Shield, and Sustain – inform this process. At this point no particular pieces of equipment are being deeply examined. Instead, the interdependencies of this capability are considered and the outcomes sought. In other words, the effects are being articulated. At present, CBP would not identify, for example, a particular air defence weapon system, but would only define aspects such as the mission sets that the army intends to employ this capability in, what sort of protection the capability is trying to provide, and what levels of operational mobility it would need.

Once the concept has sufficiently matured, it advances to the Army Capability Development Board (ACDB) for approval from the Chief of Staff for Army Strategy. With this endorsement, the concept can then progress to the *Design* phase. This phase is most notably defined by PRICIE + G[5] analysis which is a model used to classify the components required for the delivery of military capabilities. This model aims to identify all institutional outfalls that may result from projects that build the capability. For example, Light Armoured Vehicles required the construction of facilities in bases across Canada to store and maintain them. PRICIE + G allows the initial HLMRs to be expanded upon and then brought to lower levels where very specific requirements are formulated to develop a project charter and an initial Statement of Requirement (SOR) by the Directorate of Land Requirements (DLR).

The SOR is a vital document that is central to procurement as it explicitly details, for industry and others, what the army wants an item to do. SORs are typically developed in concert with user stakeholders. For the Artillery, this work is generally done by consulting with the Chief Instructor of Gunnery cell at The Royal Regiment of Artillery School (RCAS). Input from various corps is usually solicited through events, such as working groups, which helps project staff appropriately capture desired outputs of procurement in real-world terms. This phase is considering the capability's operating concept, and as such, the SOR includes things such as a developmental force employment and force generation models. This process could include support from organizations such as the Army Experimentation Centre in Kingston to consider the practicality of ideas, Defence Research and Development Canada (DRDC), NATO allies, and others. Again, although DLR is heavily involved in equipment procurement, this is not a process to buy a specific piece of equipment but aims to create a complete package with all the constituent parts of a capability.

In this phase, the project team works with agencies such as Chief of Force Development, who oversee the defence investment process, to pass necessary gateways and seek funding approval from relevant spending authorities. A major capital project over $5 million requires Treasury Board approval. Although minor capital projects of lesser value might not, they are smaller in scope and typically do not benefit from long-term capitalization, such as in service support.

In the *Build* phase, DLR, with the support of the government's authorized contracting authority, Public Services and Procurement Canada (PSPC), will facilitate a fair and open bidding process. The end result of this phase is to identify how the capability will look in the final stage to the field force. This is articulated in a Master Implementation Plan that details how the item will be rolled out to the field force. Towards this end, the SOR, and a technical offshoot called the Statement of Work (SOW), delves into technical engineering matters and detail the sought outcomes. These two documents are at the heart of the process, telling potential industrial and governmental partners exactly what the military is looking for in terms of very detailed functions, quantities, and a long term support plan.

Industry bids are evaluated under criteria established by the project, with testing of various contenders done with the support of a variety of units. Canadian Army Trials and Evaluation Unit (CATEU) in Gagetown, NB, are the army's premiere centre for trials and evaluation and design tests to support the project team's needs. Other centres such as the Quality Engineering Test Establishment (QETE) in the National Capital Region test many properties of items including electronics emissions and material properties such as tensile strength. Each project will vary as to what items need to be tested, but in order to maintain fairness and accountability of public money, these will defined and understood by potential bidders prior to participating. Of note, the department's Green Procurement policy influence selection criteria by requiring the environmental impact to be factored into the selection criteria, including elements such as the financial and environmental costs of hazardous material disposal.

When a particular bid has been selected for tender, PSPC facilitates a contracting process which considers parameters such as in service support, upgrade plans, and eventual divestment. When completed, the implementation defined in the MIP may begin. This process establishes structures but







also the initial training and doctrinal development necessary. Initial Cadre Training (ICT) is typically done by the Original Equipment Manufacturer (OEM) to create the initial group of trainers who will grow the skill set within the army and occurs roughly concurrently with the deliveries of the first of a new piece of equipment. Initial Operational Capability (IOC) and then the Full Operational Capability (FOC) are defined in this documentation, and are unique to each project.

One must keep in mind the broader definition of capability: people, process, equipment and training. It is also during the Build phase that agencies such as Director Land Force Development (DLFD) are engaged to ensure structures are established to effectively employ the capability. The Army Doctrine Centre (ADC) is tasked with ensuring that capstone and keystone doctrine is in place while the Canadian Army Doctrine and Training Centre (CADTC) will generate documents specifying the initial training requirements, called the Professional Development Needs Analysis as well as the Professional Development Identification. Training Design at the Combat Training Centre sits Qualification Standard and Training Plan (QS/TP) boards to allow for courses to be built and the respective schools engaged to create courseware. Much of this is done concurrent to the purchase of the equipment and ideally it would be in place for the arrival of the first systems.

At this time, the capability transitions to the ***Manage*** phase. implementation of the QS/TP fall typically under the purview of schools or organizational entities assigned the Centre of Excellence (COE) function. They ensure training requirements are kept up to date and the relevant authorities are kept informed on changes and, when occurring, capability deficiencies which may ignite a new round of the capability development process are identified. This may require the support of some of the enabling organizations previously mentioned when it comes to personnel and force structures. For example, Career Managers may be required to post people into positions in order to get a capability the "right person at the right spot at the right time". At a certain point, the capability becomes fully fielded and falls under the army's training and force management lines of effort.[6]

With regards to equipment, life cycle material managers (LCMMs) from organisations such as the Director General of Land Equipment Program Management (DGLEPEM) will support the equipment throughout its life for required changes. The LCMMs are informed of Unsatisfactory Condition Reports (UCR) generated by the users and they explore resolutions for these concerns. Additionally, they monitor statistics just as the mean time to failure of and facilitate upgrades in coordination with the relevant COEs and DLR. On the personnel side, it is a process that involves many players, and is elaborated on in DLFD led initiatives such as Force 2013 which outline the structures of the Canadian army. Because a capability must be appropriately manned, this is an important aspect.

It is worth mentioning that Unforecasted Operational Requirements (UOR) may emerge from time to time. A UOR is an immediate capability (likely equipment) need in order to meet a demand by forces in theatre. These will follow the same general process, but may be accelerated and bypass gateways. There are implications to this, and although equipment may be delivered, typically the other elements of capability are not fully developed and as result, items procured under UOR are not necessarily supportable capabilities for the long-term.

Capability Development is a complex process because capabilities require significant levels of planning to fully consider all the elements of doctrine, training, personnel, and equipment. Designing new capabilities includes not only the end-user, but a plethora of stakeholders from institutional elements of the military, the government, and elsewhere. Understanding how it works is a professional obligation, as the process is informed by subject matter experts from across the army. A good appreciation for the steps involved can only result in greater success and ensure the future war fighter is better enabled to meet the challenges of the future.

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[5] PRICIE + G stands for Personnel and Leadership, Research and Development and Operational Research and Analysis (plus Experimentation), Infrastructure, Environment and Organization, Concepts and Doctrine, Information Management and Technology, Equipment and Support, and Generate.

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# THE FUTURE OF STA SENSORS IN A HOSTILE ELECTRONIC WARFARE ENVIRONMENT

WO D.W. ROBERTS

THE AIM OF THIS SERVICE PAPER IS TO DISCUSS THE FEASIBILITY OF USING UNMANNED AERIAL SYSTEMS (UAS) AND ACOUSTIC LOCATING SENSORS IN A HOSTILE (DISRUPTED, DEGRADED, DENIED) ELECTRONIC WARFARE (EW) ENVIRONMENT. IT WILL FOCUS PRIMARILY ON WHAT TECHNOLOGY AND CHANGES TO DOCTRINE WOULD BE REQUIRED TO TRANSFORM THE CU-172 BLACKJACK AND HALO AWLS INTO EQUIPMENT CAPABLE OF OPERATING RELIABLY DESPITE AN ENEMY'S USE OF EW. SURVEILLANCE TARGET ACQUISITION (STA) EQUIPMENT IN ITS CURRENT STATE RELIES HEAVILY ON THE USE OF THE ELECTRO-MAGNETIC SPECTRUM. UAS CONTINUOUSLY TRANSMIT AND RECEIVE DATA IN ORDER TO OPERATE. THEY ALSO REQUIRE ACCURATE GPS SIGNALS FOR NORMAL OPERATIONS. THE HALO, ALTHOUGH PASSIVE IN ITS COLLECTION OF SOUND, TRANSMITS THIS DATA TO THE CP VIA EITHER RADIO OR LANDLINE.

## Introduction

The Canadian Armed Forces (CAF) has been operating in communication permissive environments since 2001; however, this will not always be the case. Any near peer enemy can possess the capability to intercept, locate, interfere, and degrade friendly emitters on the battlefield. Lessons learned from the Ukrainian and Syrian conflicts show that EW is being used ubiquitously. EW is being used by countries like Russia and China as an asymmetric response to negate the advantages that a high-tech adversary, such as NATO, might possess.[1] In 2008, Russian manoeuvre brigades were restructured to include an EW unit (company-sized, approx 100 pers), meaning that their ground forces do not move or conduct operations without organic EW support.[2] While these units are tactical in function, they also have five EW brigades spread across their Military Districts (MD), with two located in Western MD. These strategic level units are tasked with providing combat support to the manoeuvre brigades. Furthermore, they are investing in EW and cyber-warfare disproportionately compared to Western forces.

STA equipment is doubly threatened by EW. First, in their sensors' ability to collect information and then their ability to disseminate that information to their supported units. Equipment, such as the HALO and UAS, use relatively small antennas, fixed frequencies and low wattage output, making them susceptible to jamming and interference. Modern radars like the ELM-2084 are difficult to jam but they concentrate great power in their transmissions, putting them at greater risk of detection and targeting.[3] Therefore, it is critical that we understand how to employ our assets in a way that mitigates EW's effectiveness.

## Method/Approach

To understand this topic, I began by researching the threat and capabilities of modern EW equipment. I then reviewed the published doctrine for standard operating procedures (SOP's). I also spoke with members of the STA cells of both the Royal Regiment of Canadian Artillery School (RCAS) and Royal School of Artillery (RSA Larkhill, London) at length.Finally, I explored available and emerging technologies to see what could feasibly be implemented in future STA equipment.

## Review of Literature/Sources

To understand the threat I used the most recent Worldwide Equipment Guide Vol 1 (Dec 2015). It provided information on EW equipment and a vague overview of force protection measures that can be used. A report on Russia's EW capabilities published by the International Centre for Defence and Security (ICDS) proved invaluable for understanding the organization and tactics of their EW forces.

For SOP's, I turned to the CAF's publications on Tactical Electronic Warfare and Signals Intelligence (B-GL-351-003/FP-003), 21 EW Sqn's SOP for Electronic Protection and STA Artillery in Land Operations (B-GL-373-001/FP-001). During my visit to the RSA in Larkhill, I had the opportunity to sit down with members of the STA cell to discuss their deployment SOP's with relation to EW.

For future equipment and technologies I spoke with several members of the Tech Staff and explored several manufacturers' websites.

One obstacle that I encountered while researching this paper was that official documents that contain specific enemy capabilities were unavailable to me. They were either classified or non-existent. Questions pertaining to precise capabilities such as effective ranges, modes of operation and frequencies often went unanswered. This hampered my ability to present solutions at times as I could not be sure that they would counter the threat.

## Discussion

### UAS

The CU-172 Blackjack is the Canadian Army's small unmanned aerial system (SUAS) and will be employed as a brigade asset. It has some electronic protection measures such as encrypted digital video and command and control (C2) links, and SAASM GPS4. This provides some protection against an enemy taking control of the aircraft and spoofing its GPS. However, the system's reliance on an uninterrupted use of the electromagnetic (EM) spectrum makes it susceptible to jamming, detection and targeting.

Counter-UAS equipment has become a focus of militaries in recent years. For example, the Zhitel R-330Zh automated jammer with a range of 200km for airborne targets is used by Russia in the Western MD. It was employed as a UAS jammer during Exercise Union Shield 2015, a joint military exercise with Belarus.[5] The Shipovnik-Aero UAS interception system is capable of suppressing communication signals and depending on the complexity of the UAS, takes control of it. These systems have been used in support of separatist forces in the Donbass region. In January 2018, two Russian bases in Syria were targeted by a swarm of 13 UAS, all of which were defeated: seven with air defence weapons and six with EW.[6] Although the complexity of these UAS' C2 system is unknown, it is prudent to assume that our UAS operations would not go unchallenged against a conventional force.

The threat posed by EW to the SUAS troop's ground site is perhaps even more serious and must not be overlooked. The continuous transmissions at specific frequencies emanating from a troop position required to control its UAS make it an easy target for detection and targeting.

In order to mitigate and counter these threats, I believe that a shift in attitude and tactics are necessary. The large, static and centralized troop positions that we became accustomed to in the Afghanistan years cannot continue. The common thought amongst most SUAS users I have spoken with is that their ability to remain well back of the FLOT grants them immunity from attack and therefore precludes them from precautions such as cam and concealment, mobility and dispersion. I believe this to be a dangerous fallacy given that an SUAS troop is a high value target. It is likely that an enemy would prioritize locating it and would spend the necessary resources to ensure its destruction.

Ground control stations (GCS) must be made mobile and dispersed across the area of operations. They should have the ability to control an unmanned aerial vehicle (UAV) while on the move, making them more difficult to target. A central troop hide could still be used for maintenance and rest, but deployments would resemble the doctrine for weapons locating radars (WLR's) with detachments dispersed and mobile.

The requirement to re-transmit the UAV's video feed from the GCS to a supported unit often limits where they deploy. I argue that it is unnecessary and dangerous given that it is one more transmitter that can be detected. Instead, the SUAS troop should provide the supported headquarters with equipment to receive the video feed directly from the UAV. The American RQ-7 Shadow UAS has this capability. It would enable detachments to be mobile without worrying about LAN cabling or data radios.

Finally, to protect the air vehicle itself, I propose altering the way we communicate and control it. Since almost all counter-UAS systems rely on severing its C2 link, we deny them that ability. By fitting the CU-172 with a hard drive, a GCS could upload a flight plan with areas to be surveilled to the UAV, allowing it to carry out its task autonomously. It could be given a coordination line where it turns off its transmit and receive functions, flies its mission, and upon return re-enables transmissions. At this point, the video collected could be downloaded to the GCS and the UAV would be free for another task. This would turn the UAV into a passive sensor and decrease the amount of EM energy being transmitted over enemy-controlled areas. It would also free the UAV to reach areas that would normally be beyond its range of communication, enabling it to perform deep operations while keeping the GCS well back from the FLOT. While there is risk associated with not positively controlling a UAV, the use of assigned altitudes could mitigate it.

### HALO AWLS

The HALO acoustic locating system is perhaps the STA equipment best suited for use in a hostile EW environment. Its ability to link its sensor posts (SP's) to the command post (CP) via landline makes it a truly passive sensor. However, the time required to deploy a traditional troop in this fashion would be prohibitive. Current doctrine has one CP linked via radio to eight SP's across a frontage of 20km with 3-5km between SP's[7]. In order to achieve this, SP's would have to be sited with line

of sight to the CP, specific SP's acting as through-cluster routes (TCR's) and the CP centrally located. This inflexibility on deployment locations coupled with the low output power of the data radios (5W) and the system's use of omni-directional antennae make it extremely susceptible to jamming and interference. This interference would cause SP's to drop off the network and necessitate a detachment to move to the SP's location to troubleshoot it, exposing them to any associated risks. I propose instead that the troop be deployed with two CP's, each linked to 3-4 SP's via landline. Their deployment area must be decreased significantly as well, with SP's being no more than 1-2km from the CP. This would allow detachments to deploy and conduct battery changes rapidly. It would also ensure that the sensors would continue to function despite any EW that might be occurring in the area. The British Army has adopted a method similar to this with their HALO, sacrificing accuracy for speed and reliability. Although the decrease in frontage could result in less accurate detections, I believe that it would be necesary in a conventional war scenario. Sending three person detachments across 20kms of frontage, 3-5 kms behind the FLOT, multiple times daily to change batteries and troubleshoot SP's, is unrealistic.

The future of acoustic location is focused on smaller, self-orienting microphones such as the Microflown Avisa. It relies on one microphone per SP vice three on the HALO, which would decrease deployment times. These microphones can be attached to a variety of platforms such as vehicles or UAV's as well. While this technology represents the future, the CAF should ensure that any equipment purchased retain the ability to communicate via landline. The CP's must also be incorporated into the digital fires network to remain relevant. Currently, hostile batteries and fire missions are sent via voice radios with omni-directional antennae, exposing them to detection and jamming. The use of a digital data radio with a directional antenna instead would mitigate these risks.

**Conclusion**

STA doctrine has addressed the EW threat in its publications in the form of general siting principles and planning considerations. In practice, however, I believe we are not prepared or capable of operating in a hostile EW environment. Our learned behaviours from Afghanistan have been slow to disappear. For proof, we only need look at the equipment configurations of the newly purchased CU-172. Large, cumbersome GCS's housed in sea containers that require heavy trucks to move them leans to a mentality of FOB warfare. If we are to remain effective in a conventional war scenario with a near-peer adversary, a shift in mindset is needed. Survivability, adaptability and simplicity must move back to the forefront. Some level of precision will have to be sacrificed for the sake of speed and maneuverability. The avoidance of detection and targeting will be essential in a hostile EW battlespace. These skills cannot be learned once a conflict has already started without significant loss of life and equipment. It is therefore imperative that we re-examine our tactics and equipment with the aim of countering this threat.

**Endnotes**

[1] McDermott, Roger N. *Russia's Electronic Warfare Capabilities to 2025: Challenging NATO in the Electromagnetic Spectrum.* International Centre for Defence and Security, 2017, p.2.

[2] Ibid, 5.

[3] Electronic Warfare, B-GL-351-003/FP-003, chap 4, para 406.2

[4] CU-172 Blackjack specification,

[5] McDermott, Roger N. *Russia's Electronic Warfare Capabilities to 2025: Challenging NATO in the Electromagnetic Spectrum.* International Centre for Defence and Security, 2017, p.18.

[6] Sly, Liz. "Who is Attacking Russia's bases in Syria?" *Washingtonpost.com* January 10, 2018.

[7] STA Artillery in land Operations, B-GL-373-001/FP-001, chap 5-4-3


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