PHASE II, TASK III

Spatio-Temporal Knowledge Task Report

Prepared for:

DRDC-V

For the

Development of AF Scenarios and Critique of AF COAs

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Introduction

The purpose of the Course of Action (COA) and Recognized Air Picture (RAP) research project is to advance development of decision support computer-based tools to assist operational level commanders throughout the life cycle of a COA. As such, these tools will have to support the Canadian Forces operational planning process (CFOPP) in situation analysis, elaboration of different COAs , selection of the most appropriate one for planning, as well as the conduct of the subsequent operation. Given that, at the execution stage, the RAP is the medium to monitor the situation and develop an understanding of what is taking place in the field, then, a decision support system relative to the dynamic compilation and the dynamic exploitation of the RAP is also required.

To effectively investigate both COA and RAP decision support tools, a military scenario must be complex enough to justify the use of decision support systems for the compilation of the RAP as well as to challenge the exploitation of this RAP for mission planning purposes.

Accordingly, a contract was awarded to systematically develop and document the COA and RAP study requirements as follows:

- Phase I - Analysis of existing scenarios;
- Phase II - Detailed description of the characteristics of COAs;
- Phase III - Evaluation of COAs; and
- Phase IV - Development of vignettes for the compilation of RAP as well as for its exploitation.

The aim of Phase II, Task III, was to derive the spatio-temporal knowledge required in COA decision-making at the operational level.

Methodology

Using open source references and implicit planning experiences, spatio-temporal aspects that should be considered when developing an AF COA for an AF mission were documented. Those included:

a. the spatial considerations such as geography that makes a COA feasible and safe to execute;
b. the factors that may influence the use of resources for these COAs; and
c. the temporal considerations (ex. Synchronization issues) when planning a COA or a mission.

Results

It was found that there are few planning factors, operational considerations or strategic discriminators in COA development that do not have a time or space component to them. Some are obvious like movement tables and some are subtle like the principle of war – flexibility. Two (2) tables were produced, one at the planning factors level and the other at the COA critique level. Although time available for this task did not permit, both of those tables could be expanded to incorporate a majority of the planning factors, considerations and discriminators underlying the CFOPP. Of note, geography, as a spatial component, has a significant effect on RAP compilation and on mission planning. From the tactical perspective terrain offers both an opportunity and a hazard that must be considered thoroughly in planning and as the mission is executed.

Conclusion

The analysis of time and space is complex and often requires planners at all levels (strategic, operational and tactical) to make a large number of subjective, case-specific deductions. Most strategic and operational planning table information relating to time and space is available with planning staffs at each of their respective headquarters. The best source for similar tactical planning information is at the squadron level. Regarding RAP generation, the spatio-temporal effects of predictable geographical and other topographical obstacles are critical considerations in planning and sensor operations. Unfortunately, the scope of this task only permitted limited decomposition of the time and space components of COA development and RAP generation.

Phase II (Tâche III) – Sommaire Exécutif

Introduction

Les buts des projets de recherche Suites d'Actions (COA) et Scénarios Aériens (RAP) sont de contribuer à l'avancement du processus de développement des outils décisionnels informatisés afin d'aider les commandants du niveau opérationnel tout au long du cycle de vie de la Suite d'Actions (COA). Ainsi, ces outils devront supporter le processus de planification opérationnel des Forces Canadiennes (CFOPP) lors de l'analyse de situation, l'élaboration des différents Suites d'Actions, la sélection de la meilleure option lors de la planification, ainsi que lors du déroulement des opérations suivantes. Tenant compte du fait que le RAP est le moyen de gestion de la situation lors du stage d'exécution et qu'il sert à développer la compréhension à l'intérieur d'un champ, c'est alors qu'un système de support décisionnel relatif à la compilation dynamique et que l'exploitation dynamique du RAP deviennent nécessaire.

Afin d'enquêter d'une façon efficace sur les outils d'aide à la décision du COA et RAP, un scénario militaire doit être assez complexe pour justifier l'utilisation de systèmes d'aide décisionnel pour la compilation du RAP et doit aussi mettre à l'épreuve l'exploitation du RAP pour la planification de mission.

Donc, un contrat fut alloué afin de développer systématiquement et documenter l'étude des besoins du COA et du RAP comme suit :

- Phase I – Analyse de différents scénarios;
- Phase II – Description détaillée des caractéristiques des COAs;
- Phase III - Évaluation des COAs; et;
- Phase IV - Développement de vignettes pour la compilation des RAPs ainsi que leurs exploitations.

Le but de la Phase II, Tâche III, fut de dériver la connaissance temporelle spatiale requise lors de la prise de décision de Suite d'Action au niveau opérationnel.

Méthodologie

En utilisant des références de sources ouvertes et des experiences de planification implicite, les aspects spatio-temporels qui devraient être considérés lors du développement d'une Suite d'Action de la Force Aérienne pour une mission furent documentés. Ces derniers incluaient :

a. Les considérations spatiales comme la géographie qui rend une Suite d'Action possible et sécuritaire à exécuter;
b. Les facteurs qui peuvent influencer l'utilisation des ressources pour ces Suites d'Action; et

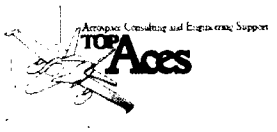
c. Les considérations temporelles (ex. aspects de Synchronization) lors de la planification de Suites d'Action ou de mission.

Résultats

On trouva qu'il y a quelques facteurs, considérations opérationnelles et discriminateurs stratégiques, lors du développement de Suites d'Action qui n'ont pas les composantes de temps ou d'espace. Quelques-uns sont évidents comme les tables de mouvement et certains le sont moins comme le principe de la flexibilité de guerre. Deux (2) tables furent produites, une au niveau des facteurs de planification et l'autre au niveau de la critique des Suites d'Action. Même si le temps disponible pour cette tâche ne le permettait pas; ces deux tables pouvaient être agrandîtes afin d'incorporer une majorité des facteurs de planification, considérations et discriminateurs soulignant le CFOPP. Il faut remarquer que, la géographie, en tant que composante spatiale a un effet significatif sur la compilation de RAP et la planification de mission. D'une perspective tactique, le terrain offre une opportunité et un danger qui doivent être considérés en profondeur lors de la planification et lors de l'exécution de la mission

Conclusion

L'analyse du temps et de l'espace est complexe et souvent nécessite que les planificateurs à tous les niveaux (stratégique, opérationnel et tactique) fassent un grand nombre de déductions subjetives de cas spécifiques. La plupart de l'information stratégique et opérationnelle venant des tables de planification, reliée au temps et espace, est disponible avec le personnel de planification à leur quartier général respectif. La meilleure source pour l'information similaire tactique de planification est au niveau de l'escadron. En ce qui à trait à la génération de RAP, les effets spatio-temporels de géographie prévisible et les autres obstacles topographiques sont des considérations critiques lors de la planification et les opérations de senseurs. Malheureusement, l'étendue de cette tâche a seulement permis une décomposition limitée des composantes de temps et d'espace du développement du COA et la génération de RAP.



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Introduction

The analysis of time and space is complex and often requires planners at all levels (strategic, operational and tactical) to make a large number of subjective, case-specific deductions. Considerations such as the amount of time it will take to build-up forces in a specific Area of Operation (AOO), the distance and time between aircraft operating bases and enemy territory along assumed routes-of-flight, or the amount of time available before a significant change to some aspect of the AOO occurs (i.e. seasonal) all must be evaluated and the effect on different COAs determined. Planners are very aware that insufficient knowledge or improper assessment of spatio-temporal aspects of the threat can prove lethal for friendly forces supporting air operations on the ground and in the air.

Aim

The aim of this task is to derive the spatio-temporal knowledge required in COA decision-making at the operational level. As such, all spatio-temporal aspects that should be considered when developing an AF COA for an AF mission will be documented. This will cover information related to the following:

d. the spatial considerations such as geography that makes a COA feasible and safe to execute;
e. the factors that may influence the use of resources for these COAs; and
f. the temporal considerations (ex. Synchronization issues) when planning a COA or a mission.

Spatio-Temporal Task

Space and Time Relationship

While aspects of time and space are considered independently, the most complex assessment is the impact of space as it relates to time. It is generally agreed that the greater the distance (space between two (2) points), the greater the time it will take to transit that distance. However, depending on the nature of the distance to be covered (desert, mountains, water) or the type of vehicle used (truck, train, ship, aircraft), the time to cover that same distance can vary significantly. Hence a spatio-temporal relationship is established. From the operational planner's perspective, once the nature of the distance and the vehicle is known then distance is normally expressed in terms of time. The planners then translate those relationships into a timeline encompassing spatio-temporal factors. They must also "analyze the impacts of timelines that have been imposed on the

operation by higher authorities or by circumstances dictated by other factors, such as weather, diplomatic/political initiatives, own or opposing force readiness and disposition, and others. The concepts of maneuver, tempo, synchronization, culminating points and operational pauses are related elements that need to be carefully examined (from the perspective of [own and enemy] sides) so as to anticipate their effects on the mission and on the selection of a COA."[1] All of these effects of space and time on a given COA must be given a relative importance, and consideration for how this will change over time must be assessed.

Planners typically possess a very good working knowledge of their own forces' capabilities. This is often referred to as the order of battle (ORBAT) and encompasses an appreciation of the basic capability of each asset, their combat strength, the readiness level of their crews, details of their armament, and all aspects of their limitations relative a mission. When own force capabilities are considered during the staff analysis process, it is generally a comparison of the strengths and weaknesses of friendly force capabilities against the enemy ORBAT, as well as, the amount of risk that will have to be accepted in order to achieve operational objectives based upon these relative comparisons. As such, extensive knowledge of the threat is critical to effective COA development. Considerations such as enemy combat strength, deployment of enemy forces, ability to attack AF operating bases, and current enemy tactics are some of the pieces of information the operational planner is most interested in learning. These capabilities in and of themselves have a spatio-temporal component, since they are based on specific assumed factors in time and space like weather, location, support, operator capability or morale. Consequently, any change in either the conditions at the time of execution or the nature of the space to be occupied or traversed could affect a capability, alter a deduction, and/or modify a COA.

Spatio-Temporal Knowledge

Operational planners' decisions rely heavily on explicit knowledge provided in reference materials, processes and Standard Operating Procedures (SOP), as well as, implicit knowledge gained from past experiences in similar circumstances or through reference to previous lessons learned. Supplemented by deductive reasoning, the planner is able to solve complex problems such as those related to time and space when developing viable COAs.

When considering spatio-temporal knowledge the explicit information is in the form of various databases contained in planning documents such as movement tables for logistical resources, readiness criteria for force components and individual combat capabilities manuals for fielded operational and tactical resources. **Table 1** is a list of some spatio-temporal information available to the AF planner. From those documents specific knowledge components and potential implication(s) on a given COA have been

[1] Canadian Forces Operational Planning Process (CFOPP), B-GJ-005-500/FP-000, p. 4-9

derived. Other planning documents include Maintenance Plans, Armament Tables, Aircraft Operating Instructions, Operational SOPs, Tactical SOPs, Intelligence Summaries detailing the enemy ORBAT and Meteorological Data.

COAs will reflect and be supported by elements of each of these reference documents as strategic and commander guidance indicates which of the spatio-temporal data points should be used. To 'freeze' the spatio-temporal variables is essential in the decision process to allow COA formulation to run a logical course to selection. In some cases, the spatio-temporal information at a specific point is known, as in calculations from movement tables, and in other cases it is uncertain, like weather conditions, and must be 'frozen' through assumptions or commander guidance.

For example, consider the case of an operation that entails a build up of force prior to the operational start date – D-day. The deployment and beddown of the forces are based on a series of calculations relevant to the availability of resources to deploy i.e. the time it will take to get them ready to deploy (readiness), the time to get to the deployment or beddown location (a function of distance and speed of transport time), and the time it will take to be ready to commence operations. Each has a timeline associated and a myriad of variables to consider such as: will the decision to deploy be a timely one?; will transport resources be available on schedule?; will weather or manpower available effect the loading, unloading or transport of resources and personnel?; do the beddown locations need to be prepared prior to operations?; is any in-theatre training required prior to D-day?; or will the environmental conditions (weather, moonlight) be suitable for commencement of operations? These uncertainties are considered individually and cumulatively using explicit facts from documents or implicit assumptions to 'freeze' each factor in time and space and allow what is essentially an implicit decision to be made regarding the D-day date. That implicit decision, one of many made throughout COA development and selection, is normally a combination of assuming the worst case scenario and tempering it with the commander's and staff's implicit knowledge of similar operations.

A listing of elements underlying implicit knowledge is represented by the operational and strategic level discriminators utilized in COA development and selection as described in section 5.4 of DRDC Report No. CR-2004-181 - The Elicitation Of Expertise Related To The Evaluation And Critique Of Courses Of Action. **Table 2 – Implicit Spatio-Temporal Knowledge Components** is an example of two (2) operational and strategic discriminators that have a spatio-temporal element. Some others from the same document are: Elevation, Precision, Stealth/Surprise, Mobility, Flexibility, Responsiveness, Concentration, Weather, Offensive Action, Security, Flexibility, Ops Tempo, Basing Timelines, Collateral Damage, Target Approval and ROE.
Derived from those implicit discriminators are related spatio-temporal knowledge components and their implications on the formulation of COAs.

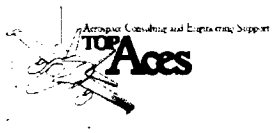
Reference Material	Information Available	Deductions	Spatio-Temporal Knowledge Components	COA Implications
Mobilization Plans	• preparation time for deployment of different forces and equipment • location of assets • personnel required for types of operations •	• calculate force availability time • calculate distance to MOBs and departure bases. • determine time for forces to be ready to deploy	• warning time required • time to receive political mandate • time to assemble specific resources • release for duty of reserve personnel • time for forces to report for duty by location	• effect on deployment times • transportation costs and time to move personnel and equipment over varying distances
Readiness Levels	• forces available • combat capabilities • training requirements pre and post deployment • types of support capabilities required	• size of force • costs • limits to beddown locations	• time to have resources operationally ready • mission specific training time • locations of mission specific resources • deployed operating base (DOB) requirements	• effect on deployment time for preparation of equipment and training of personnel • transportation costs and time to move personnel and equipment over varying distances • effect on D-day based on in-theatre indoctrination • types of missions planned for and time to acquire capability • distance to DOBs for deployment and distance (space/time) from DOBs to theatre of operations (TOR)

Movement Tables	• Load capacity of logistic vehicles (aircraft, vehicles, railcars, ships) • Loading times of equipment • Speeds of loaded and unloaded logistics vehicles • Movement of personnel	• Numbers of vehicles, ships or aircraft required • Embarkation and disembarkation points	• Time to load necessary equipment • Time to transit distances and terrain • Transport time to theatre	• Effect on deployment time for preparation of equipment and training of personnel • Transportation costs and time to move personnel and equipment over varying distances • Effect on beddown completion • Effect on re-supply and ops tempo (time between missions)
Geomatics	• AOR topography • Contours, rivers, lakes • AOR transportation structure • Road, rail, canals • AOR energy grid • Power stns, power lines	• Altitude for weapons • Terrain masking • Distance to targets • Distance to alternate targets • Areas to avoid • Dist enroute • Target complexes/choices • Target elevation •	• Route plan • Time enroute • Attack planning • Mission planning • Time on target • A/C Launch times • Combat radius • Release heights • Time to resupply	• Location of MOBs, DOBs • Transportation routes • Resupply locations • Resupply rates • Force structure • Ops tempo • Sortie rate • Target list and priority

Table 1 - Explicit Spatio-Temporal Knowledge Components

COA Discriminator	Operational/Strategic Factor	Information Available	Spatio-Temporal Knowledge Components	COA Implications
Speed	**Generic Advantage:** • Is tactical employment using speed to avoid threats **COA Comparison:** • Is time to get into theatre shorter than other options • Will the operational tempo be faster with one option • Will the mission be completed sooner using a specific air option	• Equipment capabilities • Enemy force reaction times • Enemy ORBAT • Terrain and weather restrictions • Mandated ingress and egress speeds • Mandated routings	• Reduce time to complete mission • Reduce time to theatre • Higher ops tempo	• Inherent element of surprise • Out-maneuver/out-flank enemy forces • Require efficient C2 • Achieve end state earlier • Avoid enemy defences • Limit casualties
Range	**Generic Advantage:** • Are basing options taking advantage of the aircraft combat radius • Are air supply routes consistent with load and range formulas • Are targets comfortably within the range limit of aircraft thus reducing operational risk	• Equipment capabilities • Target locations • Mandated routings • Restricted areas • AAR availability	• Beddown assets a greater distance • Varied distances travel • Greater array of targets • Greater loiter time	• Security of beddown locations • More combat fuel available for self-defense • Enhanced mission effectiveness • More fuel to reach target • Potentially more complex C2 of assets • Increased attack options • Extended air defense of long range assets • AAR requirement

Table 2 - Implicit Spatio-Temporal Knowledge Components



Compilation of a Recognized Air Picture (RAP)

Time and space factors must be considered in generating a RAP in any theatre of operations (TOO). Since the RAP is a compilation of signals from various land based and airborne sensors. The proximate location of those sensors is important as is the strength of the signals received. The greatest effects on the former is normally geography and topography and the latter is atmospheric and equipment power related.

Sensor returns from airborne objects are by and large predicated on clear lines of sight (LOS) between the object and the sensor. Therefore, any obstacle or topographical feature blocking the LOS will hide or "mask" the object from inclusion on the RAP. As well, the horizon is a geographical feature that impedes the RAP LOS. Although there are sensors such as backscatter radars that reflect radar signals off the atmosphere to look over the horizon, their ability to detect small or low altitude targets is severely limited. The only effective alternative to countering the effects of geography and topography that limit the RAP is to reposition the radar or other sensor to an unobstructed location. With airborne platforms this is relatively straight forward and can occur quickly. However, depending on the nature of the airspace (friendly or enemy, restricted or unrestricted), it may not be possible to overcome the RAP degradation. This is even more prevalent for land-based platforms, where movement to a higher vantage point or to a new location is either impossible for static systems or often involves a lengthy deployment process or transit for mobile systems. In both cases, time and space must be considered in resolving the situation.

The significant problem caused by atmospheric factors and power output that reduce the range of sensors is the physical requirement for more systems to cover the same area. Therefore, despite the same LOS problems posed by geography, the RAP may be further degraded in size and detail. In particular, precipitation has a detrimental effect on the radar returns of standard radar signals. Pulse Doppler radars are relatively unaffected by any but the heaviest rain or hail. In those situations the speed and density of the precipitation present a Doppler return and therefore a false target. To recover a complete RAP in heavy precipitation the sensor must be repositioned as it would to see around a geographical obstacle. If the RAP compilation issue is low sensor signal strength, then the normal alternatives would be to either relay the signals through an intermediate source or add more sensors to the RAP compilation network. Again, in both cases, time and space factors directly in rectifying RAP degradation.

Spatial Effects on Mission Planning

From a tactical perspective, terrain is a major consideration in the planning phase of a mission. Terrain may mask or camouflage a target which for the tactical pilot would force a certain attack or approach direction, may affect a dive attack profile and would likely affect egress from the target at low level. On the other hand, to one's

benefit, terrain can also mask the approach and egress of aircraft from enemy aircraft or air defences.

Normally, the more dramatic the terrain, i.e. mountains, the greater the impact on the planning of tactical missions. Although a mission over the desert or over water presents less unknowns than mountainous terrain, a valley doesn't have to be very deep nor trees very high to force a tactical planning decision to approach or egress from a different direction. As such, topographical data is necessary to plot details like hills, valleys, rivers, lakes and forests that would lead to a deduction such as best routes to fly, altitudes for weapons drops, and terrain masking opportunities. This would then lead to such mission planning spatial-temporal decisions as enroute distances, time to get to the target, time on target calculations, fuel available, and best launch/recovery locations.

From a contingency planning perspective, geography is a factor which force consideration of non-determinant events or contingencies such as: what if the enemy are on the other side of the hill and I can't see them, or what if the enemy has a missile on top of the hill and I can't use the terrain to mask me from him. Each "what if" needs to be considered in the planning phase of a mission to ensure that the COA decided upon is the best balance of mission success to risk.

Finally, even though geography and terrain will have a greater effect on low level missions, the ability of geography to degrade the RAP and possibly mask the enemy approach remains a cause of concern and, thus, mission planning consideration for the medium to high altitude missions as well.

Conclusion

As indicated at the outset of this task, time and space individually and how they interrelate is fundamental to military operations and planning at all levels. Indeed there are few planning factors, operational considerations or strategic discriminators in COA development that do not have a time or space component to them. Some are obvious like movement tables and some are subtle like the principle of war – flexibility. Tables 1 and 2 are a few examples of how a factor or consideration can be decomposed to a time or space element. Both those tables could be expanded to incorporate a majority of the planning factors, considerations and discriminators contained in the previous COA study. As well, most strategic and operational planning table information relating to time and space is available with planning staffs at each of their respective headquarters. The best source for similar tactical planning information is at the squadron level.

Geography as a spatial component has a significant effect on RAP compilation and on mission planning. From the tactical perspective terrain offers both an opportunity and a hazard that must be considered thoroughly in planning and as the mission is executed. Likewise, RAP sensor operators must be equally prepared to react to

predictable geographical and topographical obstacles, as well as, less predictable adverse atmospheric conditions.

References

1. DND, B-GJ-005-500/FP-00, CF Operational Planning Process, 6 November 2002.
2. DND, DRDC Report No. CR-2004-181 - The Elicitation Of Expertise Related To The Evaluation And Critique Of Courses Of Action, 31 August 2004.
3. College of Aerospace Doctrine, Research and Education. (2003). Joint Air Estimate Planning Handbook, Version 2: Maxwell AFB, AL. 6 October 2003.

Acronyms

AADC	Area Air Defense Commander
AAR	Air-to-air Refuel
ABCCC	Airborne Command and Control Center
ABR	Airborne Regiment
ACA	Airspace Control Authority
ACC	Air Component Commander
ACP	Airspace Control Plan
ACTD	Advanced Concept Technology Demonstration
ADR	Air Defence Regiment
ADX	Air Defence Multi-role Fighters
AETG	Alliance Expanded Task Group (fictional)
AF	Air Force
AFB	Air Force Base
AGL	Above Ground Level
AI	Air Interdiction
AICC	All Intercept Control Common
ALIX	Atlantic Littoral ISR Experiment
AO	Autonomous Operations
AOI	Area of Interest
AOO	Area Of Operations
AOR	Area Of Responsibility
ATC	Air Traffic Control

ATO	Air Tasking Order
ATR	Automatic Target Recognition
AWACS	Airborne Warning and Control
BAI	Battlefield Air Interdiction
BDA	Battle Damage Assessment
BKN	Broken (meteorological 6-8 tenths cloud cover)
BLOS	Beyond Line Of Site
C2	Command and Control
C3	Command, Control and Communications
CAD	Canadian Air Division
CAP	Combat Air Patrol
CAS	Close Air Support
CSAR	Combat Search and Rescue
CAOC	Combined Air Operations Center
CATF	Combined Amphibious Task Force
CAVOK	Ceiling And Visibility OK
CCG	Canadian Coast Guard
CD OP	Counter Drug Operation
CDL	Common Data Link
CDS	Chief of Defence Staff
CF	Canadian Forces
CFB	Canadian Forces Base

CFLO	Canadian Forces Liaison Office
CFNA	Canadian Forces Northern Area
CFOPP	Canadian Forces Operational Planning Process
CIDA	Canadian International Development Agency
CINC	Commander in Chief
CJTF	Canadian Joint Task Force
COA	Course of Action
COMAO	Combined Air Operation
COMASC	Commander Major Alliance Strategic Command (fictional)
CONOPS	Concept of Operations
CONUS	Continental United States
COP	Common Operational Picture
COS J3	Chief of Staff Joint Operations
CPF	Canadian Patrol Frigate
CS	Combat Support
CSAR	Combat SAR
CSE	Communications Security Establishment
CSIS	Canadian Security Intelligence Service
CSS	Combat Service Support
CTF	Commander Task Force
DCA	Defensive Counter-Air
DCDS	Deputy Chief of Defence Staff
DDH	Canadian Destroyer (Helicopter)

DFAIT	Department of Foreign Affairs and International Trade
DFO	Department of Fisheries and Oceans
DIA	Defense Intelligence Agency
DND	Department of National Defence
DOD	Department of Defence
DRDC	Defence Research and Development Canada
EEZ	Economic Exclusion Zone
ECOA	Enemy COA
ELT	Emergency Locator Transmitter
EO	Electro-Optical
EUCOM	United States European Command
EW	Electronic Warfare
FISHPAT	Fisheries Surveillance Patrol
FL	Flight Level
FOV	Field Of View
FPS	Force Planning Scenarios
FBA	Fighter Bomber Attack Aircraft
FBX	Fighter Bomber Multi-role Aircraft
GCI	Ground Control Intercept
GM	General Motors
HALE	High Altitude Long Endurance
HMCS	Her Majesty's Canadian Ship

HSD	Homeland Security and Defense
IADS	Integrated Air Defense System
IAI	Intelligent Adaptive Interfaces
ID	Identification
INTSUM	Intelligence Summary
IR	Infrared
ISR	Intelligence gathering, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition, and Reconnaissance
JCS	Joint Chief of Staff
JFACC	Joint Force Air Command Component
JFC	Joint Force Commander
JOA	Joint Operational Area
JSTARS	Joint Surveillance and Target Attack Radar System
JTF	Joint Task Force
JWID	Joint Warrior Interoperability Demonstration
KIAS	Knots Indicated Air Speed
KTS	Knots (1 nautical mile per hour)
LALE	Low Altitude Long Endurance
LANTFLT	Atlantic Fleet
LCC	Land Component Commander

LF	Land Force
LFA	Land Force Area
LFAA	Land Force Atlantic Area
LFWA	Land Force Western Area
LO	Liaison Officer
LOC	Lines of Communication
LOS	Line Of Sight
LRA	Long Range Aircraft
LRPA	Long Range Patrol Aircraft
MAC-A	Maritime Air Commander Atlantic
MAJIIC	Multi-Sensor Aerospace Ground Joint Interoperable ISR Coalition
MALE	Medium Altitude Long Range
MARLANT	Maritime Forces Atlantic
MARPAC	Maritime Forces Pacific
MCC	Maritime Component Commander
MCDV	Maritime Coastal Defense Vessel
MCE	Mission Control Element
MIO	Maritime Interdiction Operation
MND	Minister of National Defence
MOB	Main Operating Base
MOU	Memorandum Of Understanding
MP	Maritime Patrol
MTI	Moving Target Indicator

NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, Chemical
NCA	National Command Authority
NCM	Non Commissioned Member
NDHQ	National Defence Headquarters
NDCC	National Defence Command Centre
NGO	Non-Government Organization
NLE	Naval Liaison Element
NLT	No Later Than
Nm	nautical mile
NORAD	North American Aerospace Defence Command
NRT	Near-Real-Time
NSA	National Security Agency
NVG	Night Vision Goggles
OCA	Offensive Counter Air
OAS	Offensive Air Support
OGD	Other Government Departments
OPCOM	Operational Command
OPCON	Operational Control
ORBAT	Order of Battle
OVC	Overcast (meteorological)

PC	Package Commander
PM	Prime Minister
PO	Petty Officer
POD	Port of Departure
PSEPC	Department of Public Security and Emergency Preparedness Canada
QOL	Quality of Life
RAF	Royal Air Force
RAP	Recognized Air Picture
RCMP	Royal Canadian Mounted Police
RFI	Request for Information
RGP	Recognized Ground Picture
RMP	Recognized Maritime Picture
ROE	Rules Of Engagement
RTB	Return To Base
RVT	Remote Video Terminal
SA	Scientific Authority
SAR	Search and Rescue
SAM	Surface-to-air Missile
SATCOM	Satellite Communication
SEAD	Suppression of Enemy Air Defenses
SERT	Special Emergency Response Team

SIF/IFF	Selective Identification Feature/Identification Friend-or-Foe
SIOP	Single Integrated Operational Plan
SITREP	Situation Report
SME	Subject Matter Expert
SOI	Ship Of Interest
SOLGEN	Solicitor General of Canada
SPIN	Special Instructions
TA	Technical Authority
TACON	Tactical Control
TAG	Threat Assessment Group
TASMO	Tactical Air Support to Maritime Operations
TBM	Theatre Ballistic Missile
TOT	Time on Target
TPS 70	Tactical Primary Surveillance Radar
TFCLANT	Task Force Commander Atlantic
TFCPAC	Task Force Commander Pacific
UAV	Uninhabited Aerial Vehicle
UCAV	Uninhabited Combat Aerial Vehicle
UHF	Ultra High Frequency
UK	United Kingdom
UN	United Nations
USA	United States of America

UNHCR	UN Humanitarian Crisis Relief
UNSCR	UN Security Council Resolution
USAF	United States Air Force
UV	Ultraviolet
UW	Unconventional Warfare
WMD	Weapon of Mass Destruction