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Framework for Deriving Collective Training Requirements

John Brennan and Derek Sebalj
CAE Inc.

Prepared by:
CAE Inc.
1135 Innovation Drive
Ottawa, Ont., K2K 3G7 Canada
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CAE Inc.

1135 Innovation Drive
Ottawa, Ont., K2K 3G7 Canada
Tel: 613-247-0342
Fax: 613-271-0963

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CONTRACT #W7719-155268

Authors: John Brennan & Derek Sebalj
CAE Inc.

FOR

DR. STUART GRANT

Defence Scientist

Defence R&D Canada – Toronto Research Centre

1133 Sheppard Ave West, Toronto, ON, M3K 2C9

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Deriving Collective Training Requirements

Author

Name **John Brennan**

Position Executive Consultant, Defence & Security, CAE Canada

Author

Name **Derek Sebalj**

Position Simulation Consultant, Defence & Security, CAE Canada

Reviewer

Name **Shelley Kelsey**

Position Human Factors Consultant, HSI, Defence & Security, CAE Canada

Approval

Name **Frank Rivest**

Position Senior Project Manager, Defence & Security, CAE Canada

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LIST OF ACRONYMS AND DEFINITION

ACC	AIR COMPONENT COMMANDER
ADDIE	ANALYSE, DESIGN, DEVELOP, IMPLEMENT, EVALUATE
AEW	AIR EXPEDITIONARY WING
AFERSET	AIR FORCE EXPEDITIONARY READINESS STANDARD AND EVALUATION TEAM
AFETS	AIR FORCE EXPEDITIONARY TASK STANDARDS
AMAG	AIR MOBILITY ADVISORY GROUP
ARTY	ARTILLERY
ASAT	ARMY SYSTEMS APPROACH TO TRAINING
ASW	ANTI-SUBMARINE WARFARE
ATF	AIR TASK FORCE
BTS	BATTLE TASK STANDARD
BTY	BATTERY
CA	CANADIAN ARMY
CAD	CANADIAN AIR DIVISION
CAE	CAE INC.
CAF	CANADIAN ARMED FORCES
CAG	CAPABILITY ADVISORY GROUP
CBT	COMBAT
CCTS	COMMON CONTEMPORARY TRAINING SCENARIO
CDN	CANADIAN
CFAWC	CANADIAN FORCES AEROSPACE WARFARE CENTER
CFITES	CANADIAN FORCES INDIVIDUAL TRAINING AND EDUCATION SYSTEM
CFWC	CANADIAN FORCES WARFARE CENTER
CFXNET	CANADIAN FORCES EXPERIMENTATION NETWORK
COP	COMMON OPERATING PICTURE
COY	COMPANY
CT	COLLECTIVE TRAINING
CTEC	COLLECTIVE TRAINING AND EXERCISE CONFERENCE
DAST	DIRECTORATE OF AIR SIMULATION AND TRAINING
DMT	DISTRIBUTED MISSION TRAINING
DRDC	DEFENSE RESEARCH & DEVELOPMENT CANADA
ERC	EXPEDITIONARY READINESS CENTER

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FCAG	Fighter Capability Advisory Group
Fd	Field
FEA	Front End Analysis
FG	Force Generation
Gp	Group
HTA	Hierarchical Task Analysis
IPO	Input – Process – Output
ISR	Intelligence, Surveillance and Reconnaissance
JETA	Joint Experimentation and Training Account
JTF	Joint Task Force
KSA	Knowledge, Skills and Attitudes
LVC	Live, Virtual, Constructive
MAAG	Maritime Air Advisory Group
MFTA	Mission, Function and Task Analysis
MET	Mission Essential Task
MH	Maritime Helicopter
MOE	Measures of Effectiveness
MOP	Measures of Performance
MPA	Maritime Patrol Aircraft
MRP	Managed Readiness Plan
POC	Point of Contact
RCAF	Royal Canadian Air Force
RCN	Royal Canadian Navy
RTHR	Road To High Readiness
SJS	Strategic Joint Staff
SME	Subject Matter Expert
SPOTLITE	Scenario-based Performance Observation Tool for Learning In Team Environments
SOP	Standard Operating Procedures

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TA	TECHNICAL AUTHORITY
TAC AVN AG	TACTICAL AVIATION ADVISORY GROUP
TCTNA	TEAM AND COLLECTIVE TRAINING NEEDS ANALYSIS
TRG AG	TRAINING ADVISORY GROUP
TTP	TACTICS, TECHNIQUES AND PROCEDURES

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EXECUTIVE SUMMARY

This proposed Collective Training Requirements Framework (Section 5.1) is based on a review of the available literature on best practices in formulating collective training requirements. It also takes into account CAF and RCAF doctrine, training documents, directive, orders and the current practice of planning collective training events.

The work is in support DRDC Toronto Research Center in its role to provide advice to the Director Air Simulation and Training on the use of simulation for collective training. This proposed framework supports the goal of developing a framework to derive collective training (CT) requirements from the core roles of the Royal Canadian Air Force (RCAF).

CAE describes the underlying supporting concepts and the approach used to generate the framework in Section 2 – Approach. The analysis phase of this work follows in Section 3 – Analysis and comprises two main activities: information gathering followed by a detailed review, assessment and synthesis of the information gathered. Section 4: Design, describes the design of the resulting framework.

The Framework is applied in two phases. Where Battle Task Standards (BTS) currently exist, Phase 1 will guide practitioners through ensuring that the BTS for all mission(s) are current and comply with RCAF doctrine (Figure 5.1). Where they do not exist, Phase 1 begins with doctrinal mission storyboarding, followed by the analysis of collective tasks to determine which of them require Knowledge, Skills and Attitudes (KSAs) that can only be trained collectively. This process is carried out with a mind to how mission success can be evaluated, in order to inform the composition of the required measures of effectiveness. Once the BTS is established, it becomes the authoritative reference for the standards that must be met for the “superset” of doctrinal missions mandated by the RCAF to the respective community, fleet, or warfare area.

Phase 2 focuses on deriving Collective Training requirements for a specific mission or prescribed readiness level, using the established BTS as a basis. The RCAF formulates a Managed Readiness Program (MRP) based on the Joint MRP, Commanders RCAF’s High Readiness Directive and the annual Collective Training Exercise Conference (CTEC) chaired by Commander 1 CAD. The primary output of the CTEC is the annual Exercise Plan for the RCAF.

From the RCAF Exercise Plan, commanders and training authorities can identify specific mission types that will be the focus of training along with their associated BTS. This BTS subset defines the target performance state for the corresponding collective (team / air detachment / air task force). A gap analysis then compares the target performance state (readiness state) against the current performance state for all the RCAF units designated to form the collective (team / air detachment / air task force). Any identified deficiencies represent the collective training requirements.

The results of discussion with two collective training stakeholders, namely the Directorate of Air Simulation and Training and 1 Canadian Air Division A7 informed the creation of the framework.

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However, the proposed framework did not benefit from extensive review and comment from within the RCAF collective training community. Further dissemination amongst stakeholders is recommended with requests for feedback to improve and operationalize the framework.

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1 INTRODUCTION

Defence Research and Development Canada (DRDC) – Toronto Research Centre undertakes a range of research and development activities to support the Canadian Armed Forces (CAF). As part of this remit, DRDC Toronto engages industry to provide specialist support. This report represents Sub-Task 6.2 of Task 11 under Standing Offer W7719-155268, awarded to CAE Defence and Security Canada (CAE) for the purposes of providing support to Human Systems Integration (HSI), modelling and simulation (M&S), and models of complex sociotechnical systems. The Technical Authority (TA) for this task is Dr. Stuart Grant.

1.1 Background

DRDC is providing advice to the Director Air Simulation and Training on the use of simulation for collective training. There are two associated goals: the first goal is to develop a framework that derives collective training (CT) requirements from the core roles of the Royal Canadian Air Force (RCAF); and the second goal is to review the methods available for matching training media to training requirements. This report provides information that supports the first goal.

1.2 Problem Statement

The Canadian Forces Individual Training and Education System (CFITES) has a long-established, proven approach to analyzing, designing, developing, implementing and evaluating training and training requirements for individuals across the CAF. The same cannot be said about team and collective training, particularly within the RCAF. Evolved thinking on training systems and the associated training media and technologies has prompted the CAF to focus effort on establishing a level of rigour and traceability for team and collective training commensurate with those for individual training.

1.3 Objective

The objective of this work is to develop a framework to support the derivation of CT requirements for the Core Airpower Roles and Missions described in Air Force Vectors (Director General Air Force Development, 2014). The more recently published RCAF Doctrine (B-GA-400-000/FP-001, dated November 2016) was also used also used as an authoritative reference.

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2 APPROACH

This section contains a description of the underlying supporting concepts and the approach used to generate the framework

2.1 Supporting Concepts

It is commonly understood that any organization, be it a corporation, a government organization or a sports team, has objectives. Achieving the objectives requires that members of the organization possess knowledge, skills and attitudes (KSAs) both as individuals and as groups or teams in order to be able to perform tasks (Huddlestone & Pike, 2016).

In context of the RCAF, Air Force Vectors (Director General Air Force Development, 2014) describes several terms that are interrelated and relevant. Figure 2-1 depicts the key terms and their fundamental relationships.

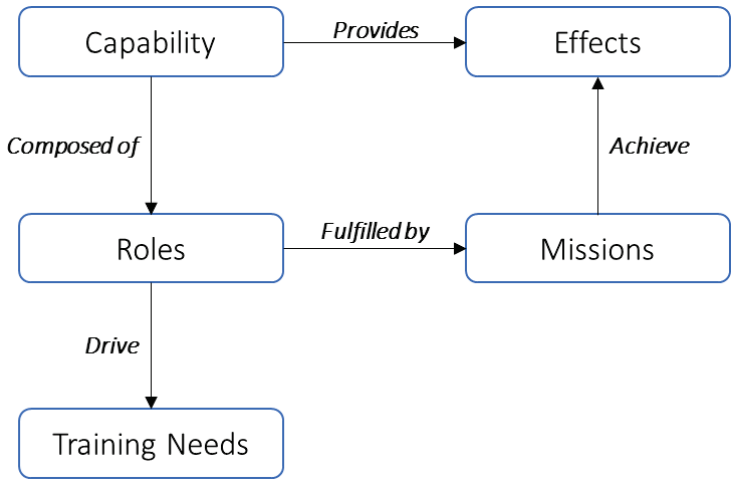

Figure 2-1: Key RCAF Airpower Terms and Relationships

Air Force Vectors also describes the RCAF preparedness concept. The diagram at Figure 2-2 was generated from the text description contained in Air Force Vectors.

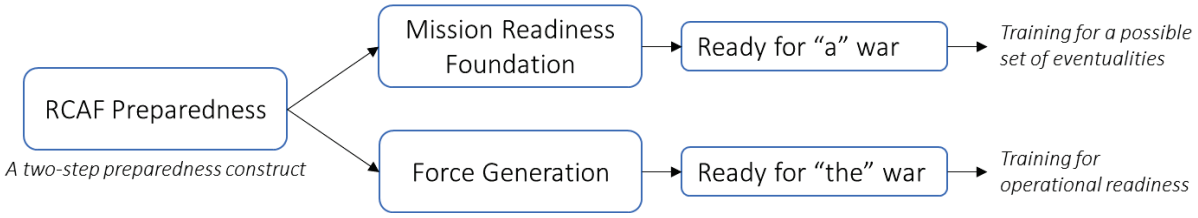

Figure 2-2: RCAF Preparedness Concept

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This preparedness construct is important for understanding and addressing the difference between Collective Training (CT) requirements associated with mission readiness and those associated with Force Generation (FG). Mission readiness requirements span the full spectrum of capabilities and roles the RCAF is mandated to provide, while FG requirements are focused on only those capabilities and roles required to achieve the objectives of the assigned operation.

The overall problem space bounded by the statement of work for this task can be viewed as an I-P-O model (Input – Process – Output) wherein:

- The RCAF Core Airpower Roles and Missions are the Input;
- CT Requirements are the desired Output; and
- The Framework is the Process (more specifically a tool that supports the Process) that translates roles and missions into CT requirements).

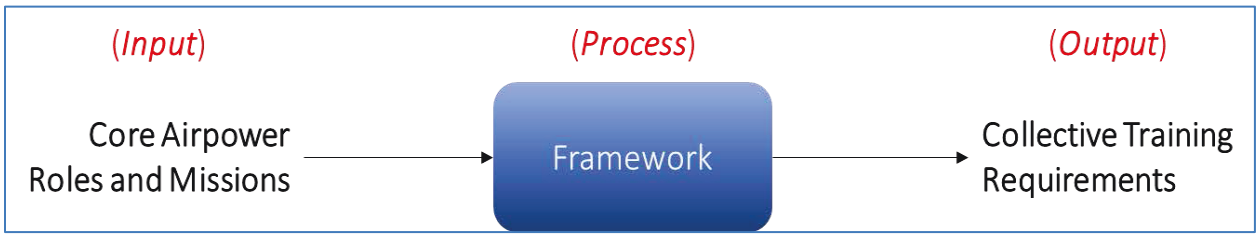

Figure 2-3: The I-P-O Model Approach

This I-P-O approach aligns with the IMO Framework (Input - Mediators - Output) identified in Salas, et al. (2015). It is also mentioned as the most common approach to the team performance context by Huddlestone (2011).

Finally, the framework should apply broadly across the RCAF and it should be designed with reuse in mind so that as the Core Airpower Roles and Missions grow and change over time, the framework can be reused to adapt the training requirements.

2.2 Approach to the Solution

The approach taken for this work is one that is common among similar bodies of work where the objective is to generate a process-based product. In fact, the approach taken was based on the first three steps of the ADDIE (Analyse, Design, Develop, Implement, Evaluate) process that underlies instructional design and training development (Culatta, 2017), and is foundational to the Canadian Forces Individual Training and Education System (CFITES)[1]. It is worth noting that the following phases of work did not occur in a pure linear fashion exclusive of each other. Rather, the team shifted phases frequently and iteratively as new information and ideas came to

[1] CFITES uses the term “Conduct” in place of Implement and it also appends Validation to the end of the process.

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light. This is common when applying an existing process like ADDIE to a new domain such as CT.

2.2.1 Analysis

The analysis phase of this work comprised two main stages.

- The first stage involved information gathering. The two main information sources were published works and subject matter experts (SMEs). The published works included government furnished information as well as publications available in the public domain. Access to SMEs proved challenging. DRDC had identified three RCAF agencies in the task statement of work. Due to RCAF personnel availability constraints, the RCAF SME information gathering was limited to interview session with members of the Directorate of Air Simulation and Training in Ottawa and 1 Canadian Air Division A7 staff. CAE was able to augment SME information through consultation with training and instructional experts within its own office in Ottawa.

- The second stage involved detailed review, assessment and synthesis of the information gathered. Specific focus was placed on identifying main themes associated with CT, particularly how it differs from individual training.

Details associated with the analysis phase of the work are contained in Section 3.

2.2.2 Design

During the design phase, the analysis phase results were used to generate a logical and coherent structure for the framework, in context of the objectives identified for this work. Details associated with the design phase of the work are contained in Section 4.

2.2.3 Development

The development phase of the work involved consolidation of the logical and coherent structure established during the design phase into a usable framework. Details of the framework, along with noteworthy discussion points are contained in Section 5.

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3 ANALYSIS

The analysis phase of this work comprised two main activities: information gathering followed by a detailed review, assessment and synthesis of the information gathered. Information sources for this task included published material and interviews from both Canadian and non-Canadian origins, as well as military and non-military applications.

3.1 Information from Publications

3.1.1 Canadian Armed Forces Publications

The process of deriving CT requirements begins with the ultimate objective of achieving a defined level of readiness to conduct operations in a real-world environment. RCAF air power roles and mission in support of the government of Canada are mandated in RCAF Doctrine (Commander Royal Canadian Air Force, 2016). RCAF Doctrine (B_GA-400-000/FP-001) was used as the authoritative source for information related to Core Airpower Roles and Missions.

Table 3-1 contains the listings of the Core Airpower Roles and Missions, and their relationship to the Core Capabilities that the RCAF is expected to bring to bear in support of CAF and Government objectives.

Table 3-1: RCAF Core Airpower Role and Missions

	Capability	Role	Mission
Core	Control of the Air	Counter Air	Offensive Counter Air
			Defensive Counter Air
			Air Defence
		Area of Operations Management	Airspace Control
			Navigation Systems
			Air Command and Control
	Air Attack	Counter Land	Close Air Support
			Interdiction
		Counter Sea	Anti-Submarine Warfare

[2] http://www.rcaf-arc.forces.gc.ca/en/cf-aerospace-warfare-centre/aerospace-doctrine.page

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	Capability	Role	Mission
			Anti-Surface Warfare
	Air Mobility	Airlift	Strategic
			Tactical
			Aeromedical Evacuation
		Air-to-Air Refuelling	
		Search and Rescue	Personnel Recovery
	Intelligence, Surveillance and Reconnaissance		Early Warning
			Recognized Air Picture

These roles and missions are the starting point for establishing the tasks and behaviours that, in turn, support the derivation of CT requirements.

Within the CAF, the Canadian Army (CA) has a relatively mature training framework. The CA has taken an organizational-level approach to training resulting in a CT framework that provides guidance to commanders, teams and individuals (Chief of Staff Army Training Authority, 2014). The Army System Approach to Training (ASAT) is an approach that seeks to balance training needs against available resources using the most effective training delivery strategies. CT within the CA must be focused on **operational requirements**, linked to achievable **standards**, **evaluated** and validated[3]. The bolded terms represent elements that are key to a training system and must therefore be deemed critical to the RCAF CT requirements framework.

A key item to point out is that CT for the CA links training activities to lines of operation and assigned Force Generation tasks. The CA divides CT into two tiers:

- Foundation Training
- Training for High Readiness
  - High Readiness
  - Theatre and Mission Specific Training (TMST)

This is comparable to the RCAF preparedness concept presented in Figure 2-2.

A final key item to note at this point regarding the CA is that like CFITES, the ASAT is based on the ADDIE process. During the analysis phase of ADDIE, the CA generates Battle Task Standards (BTS) from doctrine, annual training direction (from the annual CA Op Plan), and

[3] Bold applied by CAE for emphasis

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operation-specific training analysis. The design phase produces training directives and exercise specifications.

Through their close association with the CA, the RCAF Tactical Aviation community has published training documentation that is commensurate to that of the CA in the form of Tactical Aviation BTS (Commander 1 Wing, 2013). The Tactical Aviation BTS is the authoritative reference information for the planning, organizing and conducting CT for the Tactical Aviation community (CH146 Griffon and CH147F Chinook). Each battle task provides a common standard against which performance can be measured. Where appropriate, a given battle task standard will contain references to Tactical Aviation tactics, techniques and procedures (TTPs) and standard operating procedures (SOPs).

NOTE: **"A BTS is a collective training performance objective that provides an operational measure against which the effectiveness and efficiency of collective training can be gauged."** (Commander 1 Wing, 2013)

The Tactical Aviation BTS contains all approved BTS associated with tactical aviation doctrine, missions and tasks. Correspondingly, the document also identifies that it is not necessarily pertinent to train to all of the BTS but that a training estimate should identify the relevant BTS for an operation or mission. Essentially, Tactical Aviation crews are not expected to exercise and master all BTS at all times.

NOTE: **In this sense, a BTS can be viewed as representing the universal set of approved missions and tasks that a fleet or community could be called upon execute to fulfill its mandated roles. Training requirements for an identified mission or purpose would be formed by selecting an appropriate subset of the BTS in accordance with command intent and commander's guidance.**

Another key point identified by the Commander 1 Wing (2013) is that although the Tactical Aviation BTS are authoritative, their application requires judgement because performance must be assessed on task accomplishment not simply process or outcome. This point is also articulated in the basic definition of doctrine (Commander Royal Canadian Air Force, 2016) reinforcing the point that doctrine should not curtail a commander's freedom of action.

3.1.2 Non-CAF Publications

The primary points of emphasis associated with reviewed publications that were not sourced from the CAF were:

- Understanding the characteristics of teams and collectives.
- Assessing various approaches to and methods for identifying and documenting team-oriented tasks and behaviours.
- Identifying means through which team and collective performance can be evaluated.

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The remainder of this section provides a synopsis of information related to these topic areas that was reviewed in several key publications. The reader is encouraged to consult the references cited for further details regarding each of the aspects presented.

3.1.2.1 Characteristics of Teams

Notwithstanding the fact that teams are made up of individuals, the characteristics and behaviour of a team is more than simply a collection of individuals brought together to conduct their individual task-relevant activities (Salas, et al., 2015). Walls, McIntyre, and Smith (2010) point out that research has concluded that team-work skills are separate and distinct from task-work skills. Based on this premise, one can conclude that the training required to ensure a team is proficient at accomplishing its objective must have characteristics that differentiate it from individual training. Indeed, one would surmise that for maximum efficiency and effectiveness collective, training should address only those KSAs that cannot be obtained through individual training programs (Cross, Dohme, & Howse, 1998). Another way of putting this is that there are some KSAs that are only drawn upon in a team context (Cross, Dohme, & Howse, 1998).

The authoritative document that provides direction and guidance to organizations within the United Kingdom Ministry of Defence (UK MOD) (Ministry of Defence, 2016) points out that, “There is no agreed definition of collective training in literature or across Defence.” Indeed, within DND and the CAF there are differences in what is meant by the term collective training as is pointed out in Appendix B Glossary of Terms. Notwithstanding the differences, the general consensus seems to be that a group of individuals working together towards a common goal tends to bring factors into play that do not exist when the focus is on a single individual performing a task in isolation. (Salas, et al., 2015) identify the types and characteristics of KSAs typically required to improve team performance and organizational effectiveness. The key KSAs pointed out are:

- Conflict management and resolution;
- Communication;
- Coordination; and
- Organization.

Similarly, the UK MOD guidance (Ministry of Defence, 2016) identifies the following list of aspects associated with good teamwork:

- Coordination;
- Communication;
- Management;
- Monitoring;

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- Planning; and
- Synchronization.

As pointed out by Drzymala, Buehner, Cobb, Nelson, and Brent (2015), team-based competencies can inform CT requirements that may not be identified from a solely task-based analytic model. Salas, et al. (2015) support this by stating that team characteristics, in addition to task characteristics, will determine the type of competencies that team training requires.

Kerry (2013) discusses the subject of competencies in the military and he specifically identifies the need to differentiate between individual competencies and team competencies. Kerry presents a two-dimensional competency model that depicts how individuals can move through various stages of learning and development within a multi-layered organization such as the RCAF. The model points out key sources of information that are also identified in several other references such as doctrine, Joint Task Lists, and Mission Task Lists. Although the model provides a good frame of reference regarding relationships amongst different organizational levels concerning training and competencies, much of the detail regarding how to go about defining and describing training requirements is left to interpretation. The closing section provides some general information related to why competency models might fail within organizations. This section might prove valuable to the organizations with the RCAF that will be responsible for implementing and managing collective training programs.

3.1.2.2 Team Tasks and Behaviours

A mission typically involves the conduct of event and time-based phases through to the execution of tasks. As former operational aircrew in the maritime air domain, the authors can attest to the fact that missions can be decomposed into phases that in turn consist of a combination of planned sequence tasks and tasks that are held in contingency in the event that certain circumstances are encountered. Many of the publications reviewed during this work refer to some form of task-based analysis (task decomposition) when examining missions to conduct training.

In their chapter on task analysis, Stammers and Shepherd (1995) speak to the non-trivial nature of task structures in complex environments. They state that a task is not limited to large-scale activities or simple roles; there is a hierarchical relationship amongst tasks at different levels. They also point out that there are three interacting components of tasks that must be considered:

- Task Requirements – the objectives or goals of the task.
- Task Environment – specifically, any limiting or determining factors to performance.
- Task Behaviour – actual actions to fulfill requirements (behaviours can vary greatly based on experience).

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Stammers and Shepherd (1995) identify several types of information as properties or characteristics of tasks that may be important to a given context. The diagram in Figure 3-1 presents the list of items diagrammatically in no particular order.

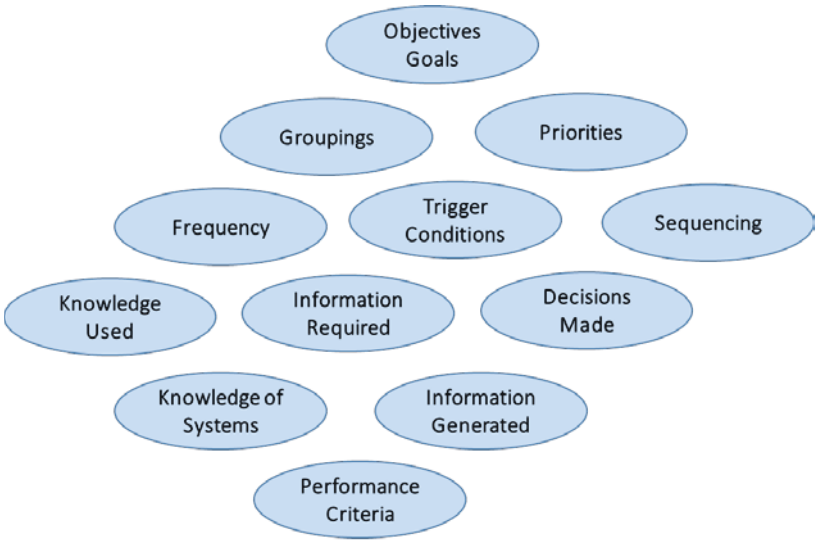

Figure 3-1: Task Properties and Characteristics (diagram built from information found in Stammers & Shepherd (1995))

Regarding the characteristic of task groupings, Stammers and Shepherd (1995) indicate that tasks are typically grouped in functional or temporal clusters. Chow, Kobierski, Coates, and Crebolder (2006) also identify these two types of groupings in their paper. This approach is not uncommon in the general domain of documenting or representing activities; often one takes a time-based or an event-based (functional) view of the domain space.

Given the hierarchical nature that tends to evolve from a task analysis activity, Stammers and Shepherd (1995) identify that the Hierarchical Task Analysis (HTA) method has general applicability. There are other methods but HTA is most common. In this method, operating goals are progressively re-described in terms of subordinate goals to form a hierarchical model of human performance. Deciding on an appropriate level of detail or granularity (i.e. where to stop the task decomposition activity) is acknowledged as a difficult determination.

An aspect pointed out by Stammers and Shepherd (1995) that is perhaps worth noting is that, in their opinion, HTA alone is not suitable for decision-making tasks. They state that some form of cognitive modelling allied to suitable training conditions is required. This theory may be supported by suggestions made by Drzymala, Buehner, Cobb, Nelson, and Brent (2015) in their paper that speaks to an alternative Front End Analysis (FEA) approach. They state that there is an increasing amount of literature reporting that task-based analyses alone are insufficient for determining training requirements in complex situations. The reasoning presented is that traditional FEA approaches do not place the needed emphasis on critical decision making, coordination, interpersonal and interactive skills. They state that traditional FEA approaches

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treat collective tasks simply as groups of individual tasks that must be performed together. Drzymala, Buehner, Cobb, Nelson, and Brent (2015) suggest that a team analysis approach wherein the focus is on team-based competencies is more suitable for establishing CT requirements that may not be identified in a solely task-based analytic model. They cite other research that concludes there are three dimensions of team competencies:

- Attitude (mutual trust and team efficacy);
- Cognition (accurate shared mental models); and
- Behaviour (closed-loop communications, leadership, mutual monitoring and team adaptation).

In their paper that compares Mission, Function and Task Analysis (MFTA) to Hierarchical Goal Analysis (HGA) Chow, Kobierski, Coates, and Crebolder (2006) provide a succinct and clear description of the MFTA process. They identify that mission decomposition can occur from different perspectives: functional groupings or different points in time (i.e. mission phases). Regarding documentation, they suggest the use of Operational Sequence Diagrams (OSDs) to provide graphical representation of sequential flow; this might prove to be a good approach for representing missions to help in identifying critical collective tasks and associated observable behaviours.

Regarding HGA, the approach is to model a cognitive system by using goals to represent desired states that require some action to achieve. In this sense, a goal hierarchy does not specify what actions should be taken; rather it specifies how the end states of actions should be assessed. In comparison, Chow, Kobierski, Coates, and Crebolder (2006) conclude that the MFTA approach is relatively easy to apply and it is potentially beneficial for informing training of specific operators for specific tasks. However, the volume of effort required for MFTA can be extensive. HGA was deemed not as intuitive because training is required to get the practitioner into a mode of thinking about assessing effects rather than tasks. HGA output does not attempt to track a mission timeline and it was deemed suitable if the area of interest is not limited to specific operators.

3.1.2.3 Team and Collective Training Needs Analysis

Another highly respected published work in the field of team and collective training is the result of eight years of dedicated research by Huddlestone and Pike. In *Team and Collective Training Needs Analysis* (TCTNA), Huddlestone and Pike (2016) propose a comprehensive model for analyzing, identifying, documenting, implementing and evaluating team and collective training. In fact, this work forms the basis of the collective training portion of the UK MOD's Defence Direction and Guidance for Training and Education, Joint Service Publication (JSP) 822. This approach to collective training needs analysis for the RCAF would benefit from the fact that a close ally also uses this method for commonality of approach for combined training as well as the benefit of an ally as an experienced practitioner of Huddlestone and Pike's methodologies. CAE recommended this method for collective training needs analysis in work completed for DRDC during Task 9 (Lamoureux & Kramer, 2017). The diagram at Figure 3-2 is

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CAE's interpretation of portions of the Huddlestone and Pike (2016) paper relating to the definition of team and collective training requirements.

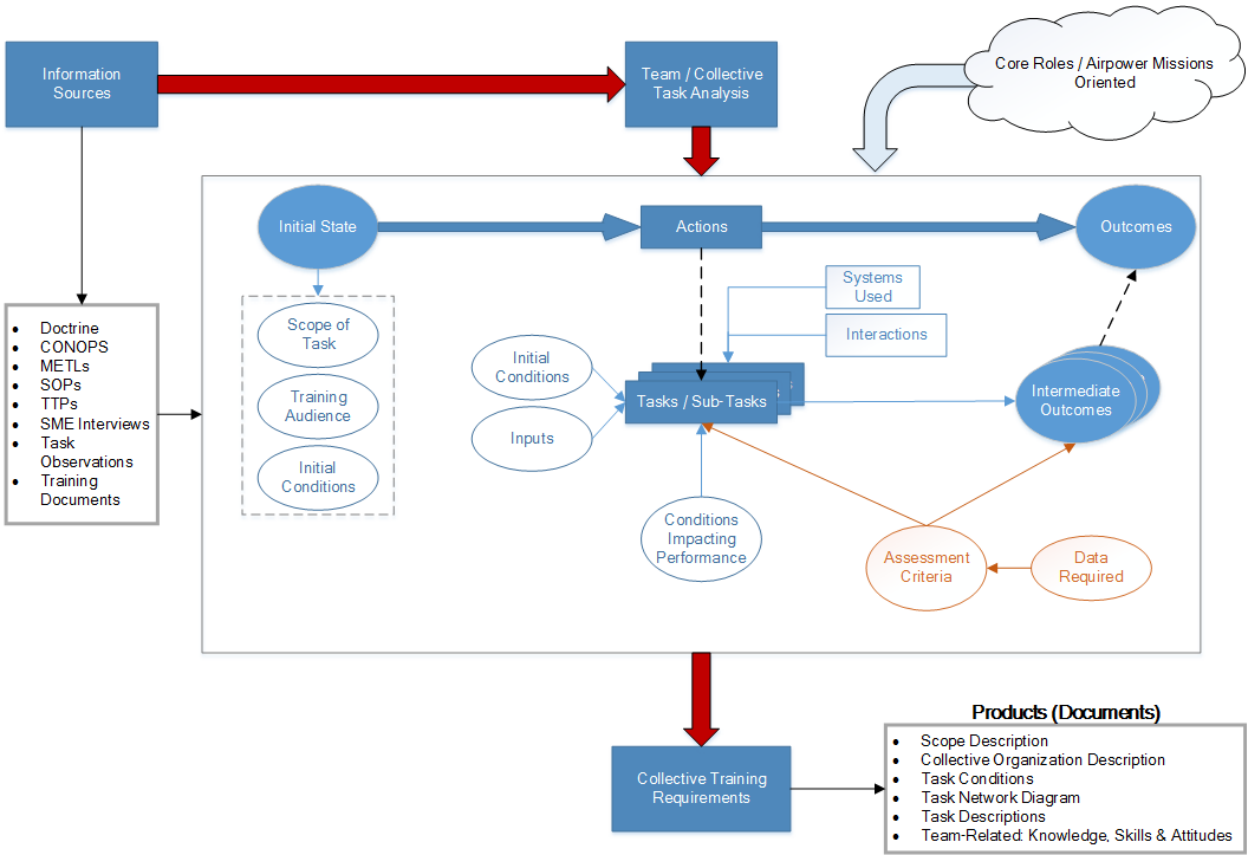

Figure 3-2: TCTNA Interpretation (based on Huddlestone & Pike (2016))

An explanation of the various elements depicted in Figure 3-3 follows.

Overall Framework

- Collective Training Requirements derivation consists of (follow the RED ARROWS):
  - Information Sources as input
  - A Team & Collective Task Analysis as the process
  - The Collective Training Requirements as output

Information Sources

- Information sources are many and varied

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- Not all will necessarily be available
- Training analysts will need to use what is accessible
- The Information Sources support the descriptions of the various elements in the Team & Collective Task Analysis

Team & Collective Task Analysis

- Team & Collective Task Analysis consists of:
  - Outcomes as the desired end-state or objectives
  - An Initial State as the definable start point
  - Actions as the means to get from the Initial State to the Outcomes
- In context of the RCAF, this analysis is driven by the Core Airpower Roles and Missions
  - The Roles and Missions have corresponding Outcomes
  - Scenarios associated with the Roles and Missions have corresponding Initial States
  - The top-level Actions to transition from Initial State to Outcomes are based on Doctrine and Concepts of Operations
- Actions can be decomposed into Tasks and Sub-Tasks:
  - Each Task and Sub-Task has (or might have) corresponding:
    - Initial Conditions
    - Inputs
    - Systems Used
    - Interaction
    - Conditions Impacting Performance
  - Each Task and Sub-Task also has corresponding Intermediate Outcome(s)
    - The Intermediate Outcomes combine to contribute to the overall Outcomes

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- From a training perspective, Tasks, Sub-Tasks and Intermediate Outcomes have associated Assessment Criteria
  - Some of these may be related to mission success criteria
  - They typically take the form of Measures of Performance (MoPs – for Tasks and Sub-Tasks) and Measures of Effectiveness (MoEs – for Intermediate Outcomes and Outcomes)
  - The Assessment Criteria support definition and description of the required:
    - Knowledge
    - Skills
    - Attitudes
  - The MoPs and MoEs that support evaluation of the Assessment Criteria need data (Data Required)

Collective Training Requirements

- The primary output from the Team & Collective Task Analysis are the CT Requirements
- These typically take the form of documented information and data (Products) from the analysis process
  - Scope Description → from analysis of the Initial State (Role, Mission, Outcomes, Scenario)
  - Collective Organization Description → from analysis of the Training Audience
  - Task Conditions → from analysis of Initial Conditions, Inputs and Conditions Impacting Performance
  - Task Network Diagram → from analysis of Tasks and Sub-Tasks and Interactions
  - Task Descriptions → from analysis of Tasks and Sub-Tasks, Interactions and Systems Used
  - Team-Related KSAs → from analysis of the Task Descriptions and Assessment Criteria

3.1.2.4 Team Performance Evaluation

Evaluation of the collective force (air detachment) is a critical part of the overall CT process, and hence an important component of the framework. As challenging as team and collective KSAs

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are to identify and define, they are equally difficult to measure. Performance must be measured against a standard for a given objective. In this context, Salas, et al. (2015) state that vague learning objectives simply specify an end state whereas precise learning objectives specify demonstrable knowledge, behavioural and attitudinal changes as indicators. As such, the granularity of the KSAs that are identified in the training standard will be reflected in the selection and specification of performance measures (Salas, et al., 2015). Nonetheless, the nature of the collective operating and hence training environment (complex interdependencies amongst individual sub-tasks and corresponding performances) makes it difficult to pin down causes of sub-optimal team performance (Cross, Dohme, & Howse, 1998).

Cross, Dohme, & Howse (1998), recommend a minimum set of performance measures, as follows:

- Process measures
- Outcome measures
- Measures of task proficiency
- Measures of knowledge and skill deficiency
- Feedback measures
- Learning trend measures

In their paper on validating and evaluating Army aviation collective performance measures, Bink, Dean, Ayers, and Zeidman (2014), describe a three step process for developing performance measures. Their process is depicted in Figure 3-4.

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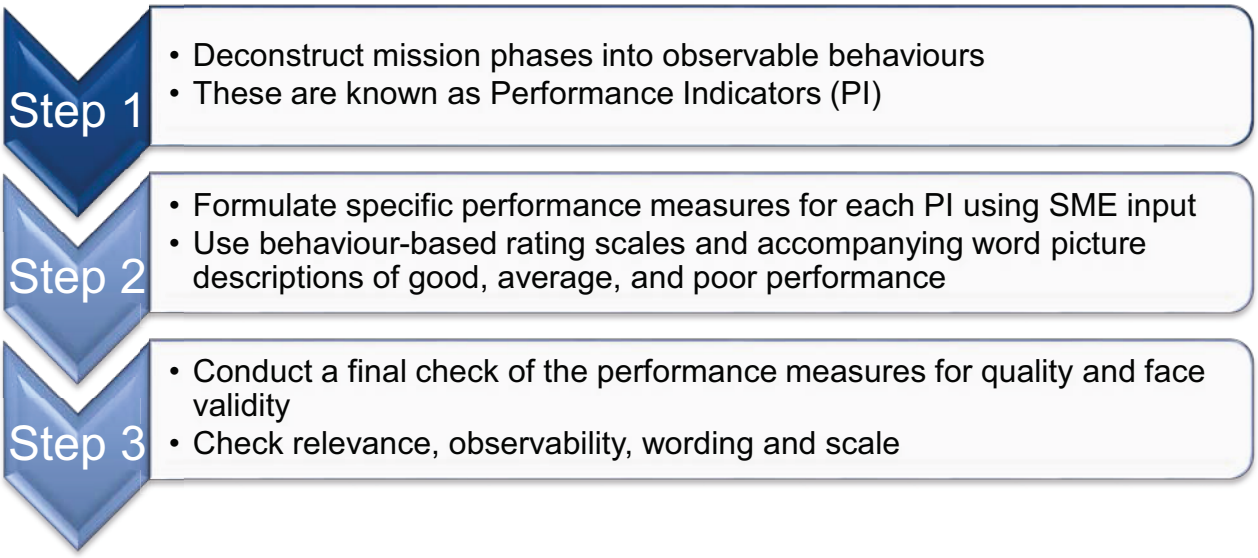

Figure 3-4: Developing Performance Measures (diagram built from information found in Bink, Dean, Ayers, and Zeidman (2014))

Bink, Dean, Ayers, and Zeidman (2014) distinguish between mission success metrics (measures of effectiveness – MOEs) and collective performance measures (measures of performance – MOPs). They state that MOEs should focus on objective mission outcomes based on training manuals and mission task lists. Examples include number of targets destroyed, number of friendly aircraft lost, and instances of fratricide. MOPs on the other hand should be based on phases of a mission. Their paper identifies over 100 MOPs for Army aviation; these MOPs are grouped into the following higher level, mission-based categories:

- Mission Planning
- En-route
- On-Station
- Target Acquisition
- Rules of Engagement / Clearance of Fires
- Employ Weapon System
- Battle Damage Assessment and Follow-on Mission

An earlier study (MacMillan, Entin, Morley, & Bennett, Jr., 2013) developed the Scenario-based Performance Observation Tool for Learning In Team Environments (SPOTLITE).

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The objective of this work was to address the difficult problem of determining where to focus performance measurement. The goal for SPOTLITE was to tie performance ratings to observer-based behaviours (as opposed to pre-determined task-based activities). A key theme in their paper is the emphasis placed on the difference between what can be measured and what should be measured. Cutting edge training systems provide trainers and analysts with the ability to identify and record vast amounts of data. However, not all data that can be captured is necessarily required for measuring the performance of a team. This is particularly important in a simulation-based training environment where an excess of data may be available. MacMillan, Entin, Morley, and Bennett, Jr. (2013) point out that the complexity of simulation scenarios precludes simple mapping of actions to outcomes. They state that some aspects of performance require expert judgment in order to take meaningful measurements and provide the corresponding feedback. One observation supporting this conclusion was that in highly dynamic and complex environments such as an air combat engagement, there is often no single *right answer* to situations; consequently, there is often a need to have SMEs evaluate performance rather than simply rely on pre-established rating scales tied to specific and concrete behaviours.

Interpreting the work of MacMillan, Entin, Morley, and Bennett, Jr. (2013), one can conclude that formulation of collective performance measures (MOPs) results from deliberate focus on observing participant behaviours in a collective training activity. An approach for identifying performance ratings was established during the development of the SPOTLITE tool (MacMillan, Entin, Morley, & Bennett, Jr., 2013). The authors of this report offer the following intepretation and extension:

- One axis of analysis focuses on identifying expected behaviours by decomposing a mission scenario into mission periods and key events (an event-based approach).
- The second axis of analysis focuses on identifying KSAs required based on a task analysis (decomposition) of the mission.
- A point of convergence occurs when the KSAs required to achieve the tasks are linked to observable behaviours – that is, behaviours that can and should be measured within the bounds of a prescribed training activity.

It is anticipated that the observable behaviours will represent a subset of all the behaviours a typical training audience will display. MacMillan, Entin, Morley, & Bennett, Jr. (2013) report that research has identified three stable dimensions of measurable team performance that are reliably associated with positive team outcomes (Figure 3-5).

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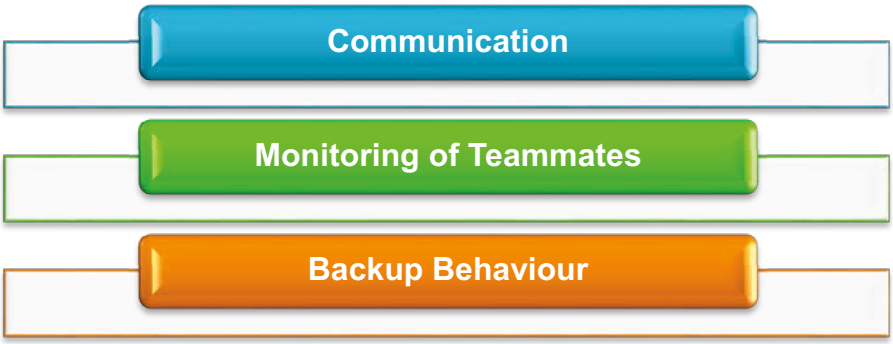

Figure 3-5: Stable Dimensions of Measurable Team Performance

A very important observation from MacMillan, Entin, Morley, & Bennett, Jr. (2013) regarding the overall process is that identification of team and collective KSAs and observable behaviours is very time consuming and demands interaction with SMEs through activities such as workshops.

3.2 Information from Discussions with RCAF stakeholders

The questions that were generated to support the extraction of information are contained in Appendix A.

3.2.1 Directorate of Air Simulation and Training (DAST), NDHQ Ottawa

The following information was obtained during an interview with members of the Directorate of Air Simulation and Training (LCol Martel, LCol Bouchard, & Capt Jorgenson, 2017).

There is no structured RCAF collective training organization beyond 1 Canadian Air Division (1 CAD) A7; this is a recognized deficiency. There also is no single organization in the RCAF responsible for the integration of core airpower roles. The RCAF has an interim policy for air force readiness and collective training: the Air Force Expeditionary Task Standards (AFETS) (1 Canadian Air Division, 2013). However, the current AFETS does not ensure that an air task force would actually be able to accomplish an assigned mission.

1 CAD is responsible for the RCAF Managed Readiness Plan (MRP) but 1 CAD currently does not design a corresponding collective training plan for the RCAF. What is done is that 1 CAD chairs an annual Collective Training and Exercise Conference (CTEC), which supports the generation of an exercise plan for the RCAF. 1 CAD disseminates this plan to the RCAF Wings who in turn assign resources (personnel and assets) to the various exercises. There is no consolidated or collective follow-up to the exercise plan developed by the CTEC.

A need exists to define mission essential tasks (METs) required to achieve the core roles and missions of the RCAF as defined by the Director General Air Force Development (2014).

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There should be a single approach and method for governing and managing collective training across the RCAF in Joint and Combined (Coalition) contexts. The specific missions and associated tactics will have their differences but the means of governing and managing the training required to support mission readiness should be common. In fact, the CAF Joint Managed Readiness Plan and the CAF Joint Task List should be of prime importance to the RCAF because many of the RCAF missions exist in a Joint context.

Regarding the approach to developing CT requirements, DAST if of the opinion that both top-down and bottom-up approaches should be used. The need to ensure CT requirements can be traced back up to RCAF Doctrine is important. Hence, a top-down approach based on decomposition of airpower capabilities, roles and missions is warranted. Equally valid is the fact that tactics, techniques and procedures (TTPs) as well as standard operating procedures (SOPs) exist within the RCAF communities and fleets; these items form the building blocks for CT requirements supporting a bottom-up approach.

Documents that hold relevance, as pointed out by the interviewees, include:

- Canadian Forces Joint Publication (CFJP) 7.2 Collective Training;
- CAF Joint Task List;
- Joint Managed Readiness Plan (MRP); and
- RCAF Managed Readiness Plan (MRP).

3.2.2 1 Canadian Air Division A7, Winnipeg MB

The following is a summary of the information obtained during telephone discussions with 1 Canadian Air Division (1 CAD) A7, LCol Scott Ash on 09 and 15 May 2017 (LCol Ash, 2017).

With regards to the definition of Readiness and Collective Training, LCol Ash stated that Readiness is the standard to achieve in meeting RCAF missions, whereas Collective Training is the means to reach the standard. Collective training is inherently a Force Generation activity. RCAF operations are inherently joint. For domestic operations, there will be an Air Task Force Commander. Not all groups (Wings, Squadrons) have Battle Task Standards (explicitly named as such) but all the information required for a BTS exists in some other form.

Inputs/Influencers to collective training include:

- The Force Posture and Readiness document, published regularly by the Strategic Joint Staff (SJS).
- The Joint Experimentation and Training Account (JETA), administered by the SJS. The JETA provides critical funding for joint training. While the JETA has some influence over RCAF collective training activities, it is not a primary driver in RCAF collective training efforts. Where it can, the RCAF will leverage the JETA.

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- The 5 Year campaign plan (from Air Force Vectors);
- The 2 Year Battle Rhythm (from Air Force Vectors);
- The Managed Readiness Plan (MRP);
- The Collective Training and Exercise Conference (CTEC); and,
- Air Force Expeditionary Task Standards (AFETS).

As well, the RCAF has interactions with the Royal Canadian Navy (RCN), Canadian Army, and the Special Operations Force (SOF) which drives additional collective training opportunities and requirements. The RCAF reciprocates those invitations to coordinate, as much as possible, with Pan-CAF collective training activities.

Large Joint/Combined training events (e.g., JointEx, Trident Fury/Juncture, etc.) are leveraged by both 1 CAD A7 and the various Wing Commanders as much as possible to fulfill their lower level of collective training (see the Annex B glossary entry on training levels for the CF's description of training levels). There was no elaboration on the mechanism by which these events become known to the RCAF or which unit coordinates any RCN, CA or RCAF participation in these events.

When asked for a functional flow and notional timeline of information from all these sources, LCol Ash stated that the RCAF is a command driven organization with direction and guidance provided from CDS, through the Commander of the RCAF, to Commander 1 Canadian Air Division (1 CAD), through Command Council to the Wing and Squadron Commanders. Based on this direction and guidance, the squadron commanders assess what training is needed, and conduct it as required.

Based on the above inputs, roles and the command driven nature of the RCAF, our estimation is that all of the above direction, and influencing factors are considered when shaping collective training. This is effected through 1 CAD A7 and the Wing Commanders as follows:

1. CAD A7 holds an annual CTEC (Collective Training and Exercise Conference). During the CTEC, and as a result of discussion, information gathering and decisions made:

a. 1 CAD A7 coordinates and plans collective training requirements and exercises for units to achieve levels 5-7 in order to meet force posture and readiness. Practically, this means planning collective training for levels 5-7 into achievable exercises for the upcoming year. The training is mostly Live, with Command Post Exercises and, to some extent, simulation. A7 has embraced the Live, Virtual, Constructive (LVC) concept, but they haven't yet fleshed out all the details on how to utilize it to achieve CT requirements. As well, 2 Wing ERC takes various performance standards and develops CT packages for levels 5-7. AFERSET (8 Wing Trenton) who works for Directorate of Air Readiness, certifies that units have met the desired standards at levels 5-7

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b. Wing Commanders, assisted by their respective CAGs (Capability Advisory Groups) coordinate and plan collective training requirements and exercises for crew/elements/unit to training for levels 2 through 4. The experience and knowledge of Squadrons COs and their staffs is relied upon to determine which training is required.

It is important to note that the SJS Force Posture and Readiness document should be available both on the DWAN (unclassified version) and CSNI (unclassified document with classified annex). While attempting to read this document, the DWAN location for the document referred the Task TA to the CSNI. The Task TA attempted to retrieve a copy of the document to inform this task, however, as of the report due date, this document was not yet available to CAE.

3.2.3 Comparison and Analysis

There are discrepancies between the DAST and 1 CAD A7's understanding of the collective training process within the RCAF. Without further discussion with other RCAF stakeholders, it is not possible to determine how significant the impact of these seemingly different perspectives might be on a methodology to gather collective training requirements and the effect on this proposed framework. The only conclusion we can draw from the information gathered is that there is a different understanding of how collective training requirements are determined and that further discussion and consultation with these and the other RCAF collective training stakeholders is necessary.

DAST states that there is no structured RCAF collective training organization below 1 CAD A7. A7 states that it has devolved collective training, levels 2-4 to the Wing Commanders and their associated Capability Advisory Groups and Squadron commanders. The implication is that the Wing Commanders will provide crews ready at collective training levels 2 through 4 for operations or further training at levels above 2 through 4. Whether this arrangement is considered a "collective training organization" is subject to interpretation and beyond the scope of this task. However, it is noteworthy that two RCAF organizations have differing interpretations of collective training organizations' roles.

There is not a common definition for collective training across the RCAF. According to 1 CAD A7 there was an attempt made to draft one within the Managed Readiness Plan. The new RCAF doctrine speaks its importance in maintaining integral air capabilities, despite the fact that there is no current RCAF wide definition. A definition is a foundational aspect of this framework. A common definition for collective training in the RCAF is necessary, not only for the sake of this framework, but for a common understanding of the training required to meet readiness requirements, especially where the operations involve two or more fleets of aircraft. However, it may be sufficient at this point for collective training practitioners to acknowledge that there is no common RCAF definition for collective training. This acknowledgement should prompt users of the proposed framework to ensure that all participants in the collective training requirements gathering process clearly understand the bounds of their task before proceeding with gathering requirements. It will impose an additional step at the outset of their processes.

At the start of this task, the intent was to discuss this framework with several other RCAF stakeholders. We were unable to coordinate meetings and/or telephone discussions to gather

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information on the roles the other stakeholders play in collective training, or to solicit feedback on the framework. Following discussions with DAST and 1 CAD A7 the list of collective training stakeholders grew to the following:

- 2 Wing Expeditionary Readiness Centre, Bagotville QC;
- Canadian Forces Aerospace Warfare Centre, Trenton ON;
- AFERSET – 8 Wing Trenton; and
- Capability Advisory Groups:
    - Fighter Capability Advisory Group (FCAG) – POC Col DE Molstad, 3 Wing;
    - Maritime Air Advisory Group (MAAG) – POC Col PA Thauberger, 14 Wing;
    - Air Mobility Advisory Group (AMAG) – POC Col CR Keiver, 8 Wing;
    - Tactical Aviation Advisory Group (Tac Avn AG) – POC Col JUES Boucher, 1 Wing; and
    - Training Advisory Group (Trg AG) – POC Col DP O'Reilly, 15 Wing.

Buy in from these groups, (and likely other RCAF unit and groups) will be critical for the adoption of this framework in either its current form or any evolved form it might take following consultations. CAE recommends the coordination of this document with these various stakeholders and solicitation of their comments to ensure a practical framework for determining collective training requirements.

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4 DESIGN

This section describes the analysis of the information gathered during the task and the resulting framework design.

4.1 Principal Concepts and Assumptions

A few key concepts and assumptions were identified based on the analysis conducted. These concepts and assumptions are considered foundational to the coherency of the logic expressed in the remainder of this section:

- Effective training is obviously fundamental to mission achievement. (Chief of Review Services, 2005)
- The term “collective” implies teamwork, which in turn implies that some minimum level of common understanding must exit amongst participants. Common understanding is established through cooperation and information exchange.
- It is unreasonable to expect a team (or collective) to exercise and master all missions or tasks at all times (Commander 1 Wing, 2013).
- A team (or collective) has an initial performance state with respect to all mission and task. The initial performance state is typically “non-zero” (i.e., the team possesses some domain relevant knowledge, skills and attitudes).
- Mission success depends on the ability to perform a task to a certain standard.
- The tasks associated with a specific mission represent a subset of the team’s (or collective’s) “superset” of mandated tasks.

4.2 Operational and Training Context Logic

This section contains the foundational logic underlying the design of the framework. This logic is associated with aspects of the RCAF operational domain as well as the training domain.

4.2.1 Mission Perspectives

As per RCAF doctrine (Commander Royal Canadian Air Force, 2016):

1. Capabilities deliver airpower:
2. Roles fulfill capabilities; and,
3. Missions are the instantiations through which roles are exercised or executed

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A key point of understanding is the two possible perspectives on the term “mission”, which are depicted in Figure 4.1 and 4.2 below. This distinction becomes important later in this document during the discussion that focuses on deriving training requirements based on missions, standards, and performance states.

4.2.1.1 Doctrine-Oriented View of Mission

Figure 4-1 depicts the term mission as it is used in RCAF doctrine to describe the RCAF’s capabilities, roles and missions (Commander Royal Canadian Air Force, 2016).

In this perspective “missions” are the decomposed, generic elements of each role. Within RCAF doctrine, the missions within any given role are implied to fulfill that role.

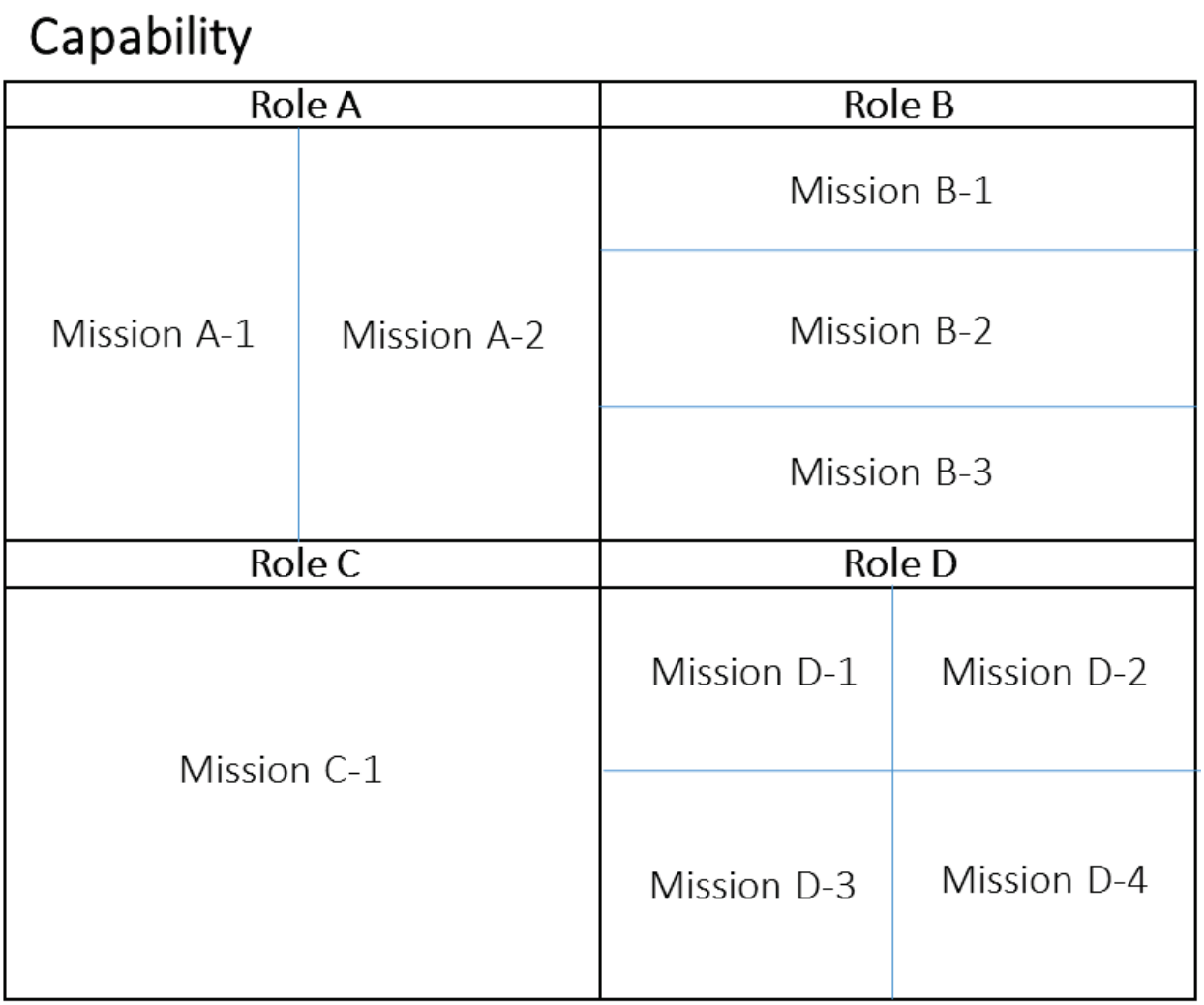

Figure 4-1: Doctrine-Oriented View of "Mission"

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4.2.1.2 Operations-Oriented View of Mission

Figure 4-2 depicts the term mission as interpreted in the world of military operations. In this second perspective, the word “mission” refers to a real world operation that may be assigned to the RCAF by the Government of Canada. The deployed force would exercise only those portions of its overall capability required to achieve the objectives of the mission.

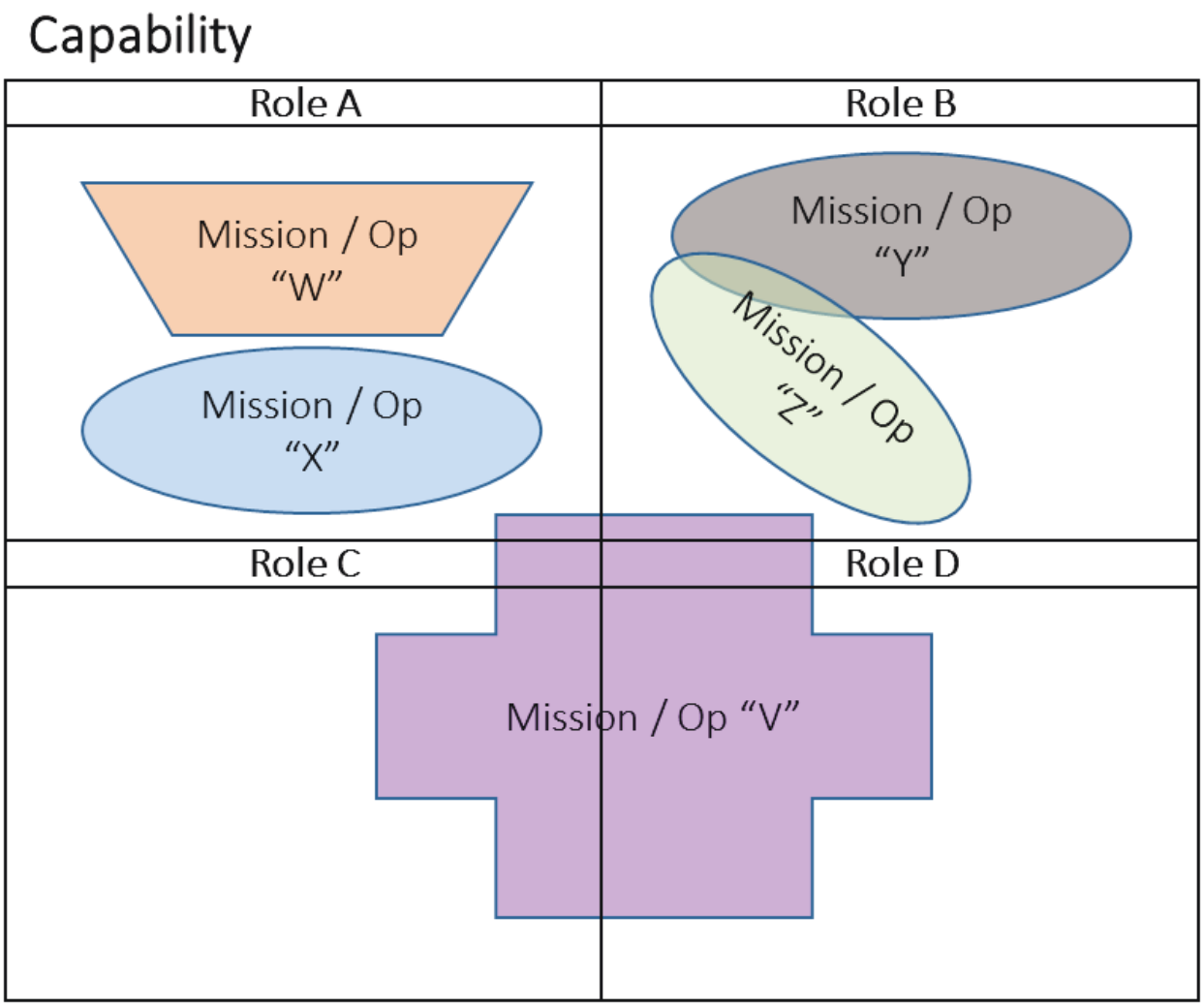

Figure 4-2: Operational-Oriented View of "Mission"

These two different perspectives of “mission” are important to understand with respect to the framework design. The tasks associated with operations-oriented missions will typically represent a subset of all tasks associated with the corresponding doctrine-oriented role(s). For example, a CP-140 Maritime Patrol aircraft has several doctrine-oriented roles that its crew

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could fulfill in support of RCAF operations, including Anti-Submarine Warfare (ASW) and Intelligence, Surveillance and Reconnaissance (ISR) roles. CP-140s in an ISR role in a desert Area of Operations are very unlikely to perform ASW duties. The Operations roles are a subset of the doctrinal roles the CP-10 can fulfill. This distinction between doctrinal roles and operations roles becomes important when identifying training requirements within the RCAF's strategic guidance framework and battle rhythm (see Figure 4 in *Air Force Vectors* (Director General Air Force Development, 2014).

One further decomposition of mission is required and the reader is referred to Figure 3-2 as a reminder that a mission can be broken into a series of tasks and sub-tasks. This becomes important when relating Battle Task Standards to missions in section 4.3 that follows.

4.2.2 Team Performance States

The items presented in this section are logic elements associated with performance states that are pertinent to the design of the framework.

In order to determine team performance states their performance must be observed and evaluated to determine collective training requirements. It consists of an evaluation of the combined knowledge, skills and attitudes of the individuals comprising the team, as well as the attributes and characteristics associated with the team structure and roles (Huddlestone & Pike, 2016).

Recall that training can be defined as a necessary activity that is conducted to improve performance. In relation to performance states, the role of training is depicted in Figure 4-3. Here we see that Training 'x' is conducted to transition a team from Performance State '0' to Performance State 'x' for a defined mission or readiness level.

Figure 4-3: Changed Performance State through Training

Scaling this model begins to provide a more practical view of the real world environment. A fighting force (such as the RCAF) can potentially be called upon to conduct several missions over an extended period of time. The RCAF is composed of several organizational elements, each of which will possess a certain performance state. Correspondingly, each mission will demand its own performance state (readiness) based on the objectives assigned by the government. RCAF elements assigned to missions will need to undergo tailored training based on training plans that are created through a gap analysis between the elements' current performance states and the performance states demanded by the missions.

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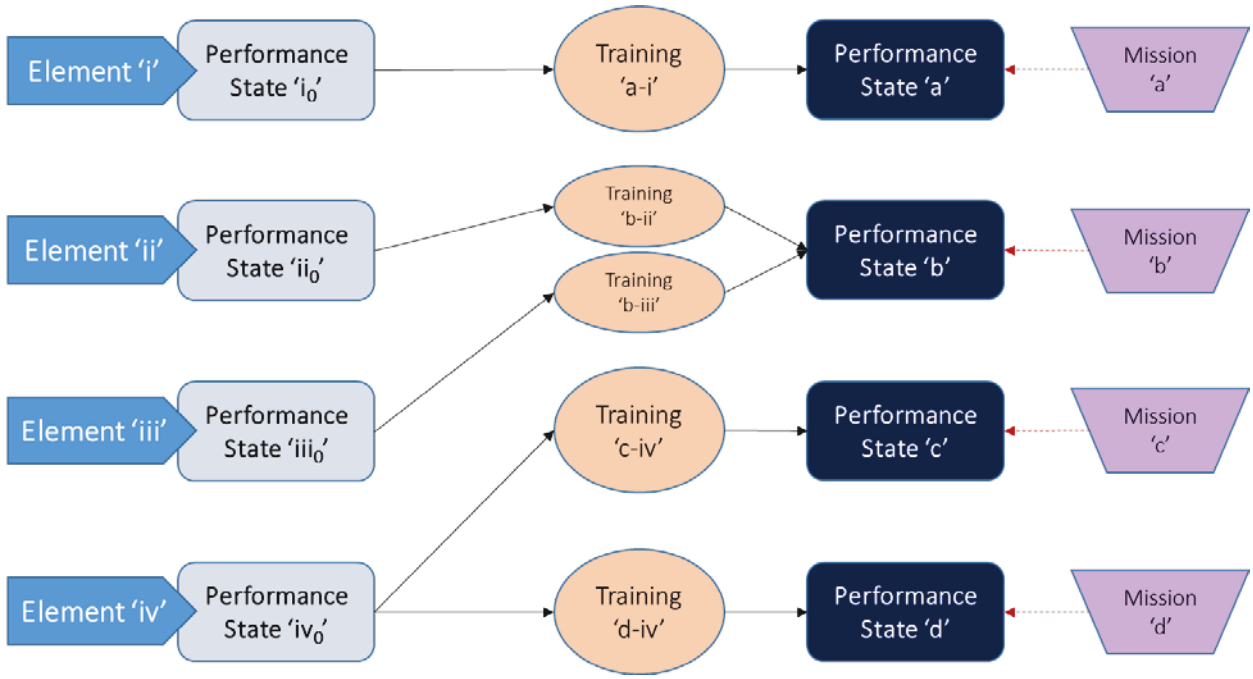

Figure 4-4: Multiple Mission Training in a Complex Organization

4.3 Framework Design

A framework is defined as "a basic conceptual structure "[4]. More specifically, a curriculum framework is defined as "an organized plan or set of standards or learning outcomes that defines the content to be learned in terms of clear, definable standards of what the student should know and be able to do"[5]. It is also important for the framework to clearly identify (be traceable to) the authoritative source information for the applicable domain.

Successful mission completion in the collective sense relies heavily on shared understandings and awareness, amongst the cooperating forces of the following parameters:

- the operating environment
- mission objectives
- the assigned role(s) for each force element; and,
- the capabilities of each force element to complete their assigned roles.

[4] https://www.merriam-webster.com/dictionary/framework accessed on 21 March 2017
[5] https://en.wikipedia.org/wiki/Curriculum_framework accessed on 21 March 2017

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As always, mission success also relies on cooperation. The nature of CT and any associated framework for deriving training requirements, must take all of these aspects into account.

In the RCAF CT context the framework must be linked to RCAF doctrine and the mission or task standards that derive from this doctrine. Overall, the framework has several components related to the processes and activities associated with the CT context: mission-oriented information sources; participants; tasks analysis; KSAs; measures of effectiveness and performance; and resultant training requirements.

Based on the logic described in Section 4.2 the design of the RCAF CT Framework must consist of two main phases (Figure 4-5):

- Identification and confirmation of Battle Task Standards (BTS); and
- Formulation of Collective Training (CT) requirements.

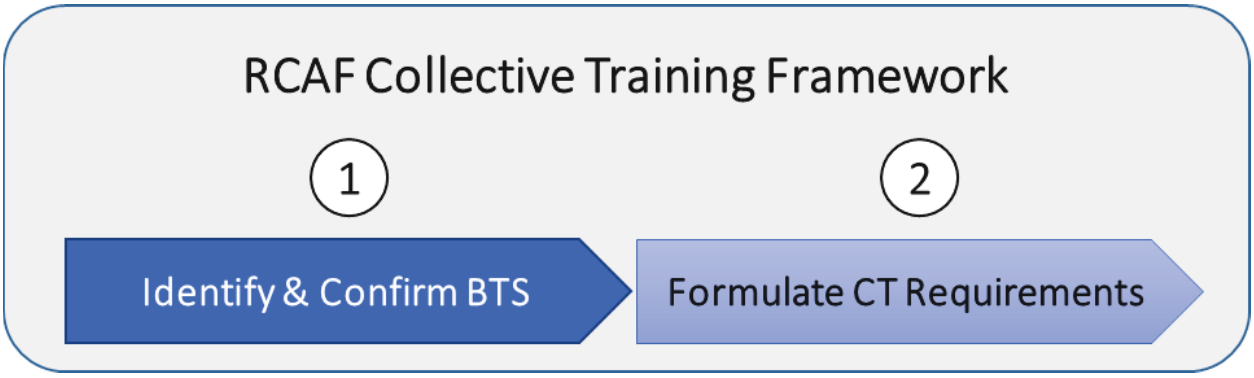

Figure 4-5: RCAF CT Framework Main Components

This two-phased approach is fundamental to the establishment of collective training requirements. Without the BTS is no referent against which a training plan can be devised (for a given mission), and hence no basis for training requirements.

4.3.1 Generate Battle Task Standards

The BTS for a given doctrine-based role or mission area can be derived through a task analysis. This task analysis can be assisted greatly by creating a mission scenario timeline (essentially a story board of a typical mission). During the creation of this story board, the analyst must identify three key outputs:

- The critical collective tasks conducted by the team(s) of participants;
- The expected behaviours for successful conduct of the tasks; and

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- The knowledge, skills and attitudes (KSAs) required to accomplish the tasks.

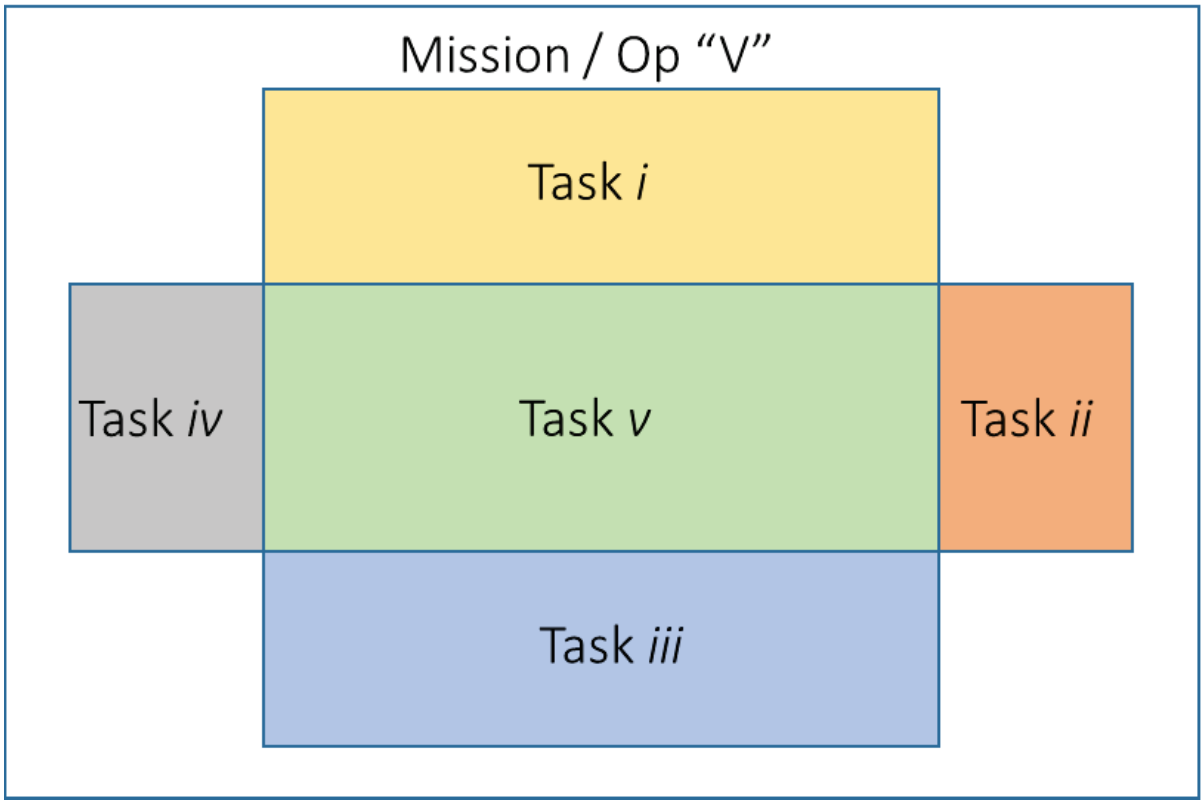

Figure 4-6: Mission and Task Relationship

In conducting this BTS generation activity it is important to remember that, in the collective context, the tasks, behaviours and KSAs of interest are largely cognitive in nature, such as evaluating intelligence information (Cross, Dohme, & Howse, 1998), as opposed to the more familiar psychomotor skills such as flying an aircraft or operating a sensor.

There is an underlying assumption that must be explicitly articulated in order for those involved in this phase of the Framework to clearly understand the relationships between roles, missions and the task standards that will be generated during this phase. Each mission described in Section 4.2 of this document can further be broken down into Tasks, as depicted in Figure 4-6. These tasks may be performed by one or more elements involved in a specified mission. Furthermore, one element may perform more than one task. These tasks are the focus of Phase 1 of the framework and form the basis of the BTS.

4.3.2 Formulate CT Requirements

Once an established and approved set of BTS is available, CT requirements can be formulated following the logic presented in Section 4.2. From the full BTS, a subset of the standards can be

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selected based on a defined operation or a prescribed readiness state. This BTS subset is the basis for defining the team's (collective's) target performance state. Using a gap analysis approach, the target performance state is compared against the current performance state (status) of the units and crews that comprise the team (collective). Any deficient BTS form the basis for identifying and defining training needs for the operation or readiness state. The relevant BTS will also provide information that supports the establishment of suitable Measures of Performance (MOPs).

4.3.3 General Remarks

Following are some general remarks associated with the overall design of the RCAF CT Requirements Framework.

Given the generally cognitive nature of the collective context, the design and use of the framework requires an approach to avoid driving the output to the point of specifying individual system knowledge and operating skills. The KSAs identified as a result of using the framework must be limited to interactions amongst team members that support shared understanding and awareness, and cooperation.

As emphasized in MacMillan, Entin, Morley, & Bennett, Jr. (2013), the identification of KSAs and observable behaviours is time consuming, requiring planned interaction with subject matter experts through activities such as workshops.

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5 DEVELOPMENT

This section describes the framework that was developed and provides points of discussion relevant to its application.

5.1 The Framework

The RCAF Collective Training Framework (Figure 5-1) covers the full process implied by the I-P-O model discussed in Figure 2-3.

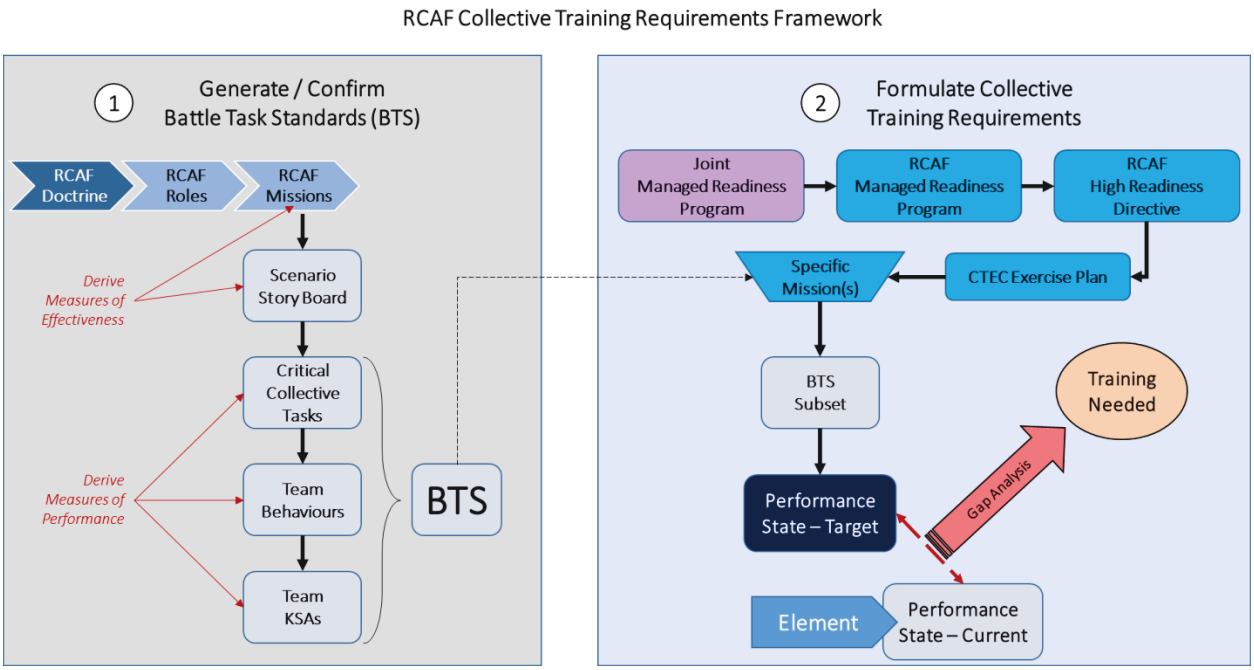

Figure 5-1: RCAF CT Requirements Framework

5.1.1 Phase 1 – Generate/Confirm Battle Task Standards

Aimed at generating or confirming that suitable BTS exist, phase 1 (Generate/Confirm Battle Task Standards) begins with ensuring that the mission(s) to be analyzed comply with current RCAF doctrine (Figure 5-1). Storyboards are created for each of the prescribed missions. A story board, in this context, illustrates the key phases of how the mission evolves in an ideal sense (i.e., for full mission success). Another important element within this process is to determine how to measure mission success. This will aid in defining suitable measures of effectiveness.

Based on the story board activity, the next objective is to analyze the team and the associated critical collective tasks. Critical collective tasks are tasks that require KSAs that cannot be

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reached through individual training alone (Cross, Dohme, & Howse, 1998). This is the most challenging part of the overall process, mainly because it is difficult to determine the level of granularity required when decomposing the mission into tasks and subtasks. Therefore, it may prove more beneficial to begin with identifying team behaviours that one would expect to see during the conduct of the mission. Once behaviours are identified, they can then be used to fulfill two aspects of this first phase of CT requirement definition:

- team behaviours can be translated into mission tasks; and
- team behaviours can be used to identify the KSAs required.

The Tactical Aviation BTS (Commander 1 Wing, 2013) is recommended as the format for documenting BTS for the RCAF. The structure and content of a Tactical Aviation BTS is aligned with the structure and content of Canadian Army BTS (Directorate of Army Training, 2007), as well as guidance in other literature (Salas, et al., 2015; 1 Canadian Air Division, 2013; Training and Doctrine Command, 2004; Ministry of Defence, 2016; Department of the Army, 2006).

Once the BTS is established, it becomes the authoritative reference for the standards that must be met for the “superset” (Section 4.2.2.1, Figure 4.1) of missions mandated to the respective community, fleet, warfare area or RCAF as a whole.

5.1.2 Phase 2 – Formulate Collective Training Requirements

The objective of Phase 2 of the process is to derive CT requirements for a specific mission or prescribed readiness level, using the established BTS as a basis. The upper portion of the Phase 2 block in Figure 5-1 depicts the main artifacts from which specific missions can be identified. The RCAF formulates a Managed Readiness Program (MRP) based on the Joint MRP. From this RCAF MRP, the Commander RCAF issues a High Readiness Directive. This directive is used as input to the annual Collective Training Exercise Conference (CTEC) chaired by Commander 1 CAD. The primary output of the CTEC is the annual Exercise Plan for the RCAF.

Using this Exercise Plan, the affected commanders and training authorities can identify specific mission types that will be the focus of training. These mission types will guide the selection of a subset of BTS from the overall BTS (discussed in Phase 1). This BTS subset defines the target performance state for the corresponding collective (team / air detachment / air task force). In turn, this target performance state serves as the basis for deriving the training needed.

In order to determine the type and amount of training needed, the target performance state (readiness state) must be compared against the current performance state for all the RCAF units designated to form the collective (team / air detachment / air task force). This is a gap analysis. The primary output from the gap analysis will be a set of BTS for which performance deficiencies exist within the identified RCAF collective element. These identified deficiencies represent the foundation of a training plan in the form of a set of collective training requirements. The specific means by which the current performance state is defined, and subsequently compared to the target performance state, may vary from fleet to fleet and community to

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community within the RCAF. This is an RCAF organizational responsibility, the details and management of which fall outside the scope of this work.

5.2 Applying the Framework

5.2.1 Analysis Versus an Existing BTS

The existing Tactical Aviation (Tac Avn) Battle Task Standard (B-GA-446-002/PT-001) were analyzed versus the draft CT Requirements Framework to gain some insight into the utility of the proposed framework, gather some insight on applying the framework, and identify any challenges that practitioners may encounter. The following observations are the result of that analysis, as follows:

- A noteworthy challenge is determining the lowest level of granularity of task. This is a difficult issue (as per Stammers & Shepherd) since the practitioners will likely only realize that the lowest level of granularity has been realised and, in fact, exceeded once the task has been broken down from a collective task into an individual task.

- The application of the framework and the associated terminology will vary across the RCAF from fleet to fleet:

    - Due to the varying structure of “teams” and the roles they fulfill:

        - If crews remain relatively constant, and a change in a crew occurs due to the inherent nature of military personnel movements, at what point do new crew members render a crew “non-current” or “not ready” in terms of proficiency or readiness. What are the impacts to collective training?

        - If crew composition changes regularly, how is readiness maintained and/or assessed?

    - Due to the different warfare domains involved.

- Therefore, it’s appropriate to have a generic framework that, once applied, results in multiple instantiations:

    - By domain / warfare area

    - By community

    - By fleet

- A discussion regarding the links to Joint and Combined collective training is necessary with all RCAF collective training stakeholders. In many circumstances, collective training will involve elements from the RCN and CA (e.g., MH/MPA ASW with RCN ships, Tac Avn elements with the CA). Since CAF operations are inherently joint, it will be important to align

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concepts and terminology between the RCAF, RCN and CA, as well as bi-lateral, coalition and NATO partners.

- We suspect that most RCAF collective tasks and the associated KSAs are currently undocumented as collective training tasks or BTS, the initial application of the framework will need to be "broad-brush" across all RCAF airpower roles and missions. Pragmatically, the eventual use of the framework on an on-going basis will require a modified approach whereby commanders will need to consider the readiness status of the target training audience (proficient KSAs). Subsequently, prioritized CT requirements for an identified mission will result from a gap analysis between the air detachment's (or AEWs) existing KSAs (current proficiency) and the set of KSAs considered necessary for mission success (target performance). This relates back to the figure early in the document regarding the Force Generation Concept, specifically the difference between "***A*** war" and "***The*** war" (Figure 2-2).

- The RCAF role differs significantly enough from the RCN and the CA that concepts of and approaches to Collective Training encounter alignment challenges. Other than Control of the Air, the RCAF is primarily an organization that supports maritime and land-based operations. As such, unlike an army battalion or a naval ship, RCAF assets typically do not train in large formations (e.g., Wing) over long periods of time towards common high-readiness goals.

- The Tactical Aviation (Tac Avn) community within the RCAF operates in a unique context from an RCAF perspective. The CH146 and CH147F fleets are integrated into the Canadian Army's managed readiness plan – the "Road To High Readiness" (RTHR). As such, a CH146 squadron and a CH147F flight are integral elements to an overall army formation that follows a deliberate two-year plan to achieve high readiness for an assigned (or otherwise) operation or readiness requirements as specified in the RTHR. Furthermore, the Tactical Aviation community is uniquely structured from an organizational perspective within the RCAF. Unlike most other RCAF Wings, which are location-based organizational structures, 1 Wing is a Tac Avn community-based organization located at CFB Kingston. All Tactical Aviation squadrons located within CA garrisons across the country report to 1 Wing.

- The Tactical Aviation Battle Task Standards (B-GA-446-002/PT-001) were worked into the draft CT requirements framework to gain some insight into the utility of the proposed framework. This exercise proved useful in several respects, as follows:

    - The roles of Tactical Aviation (Tac Avn) is to provide the Army with mobility, firepower and reconnaissance. (para 3 of B-GA-446-002/PT-001). At first glance, these do not exactly align with the RCAF Doctrine roles (B-GA-400/FP-001 RCAF Doctrine). However, as one looks further into the Tac Avn BTS, the various BTS fit into the RCAF doctrinal roles, missions and activities. However, there isn't always a one-to-one correlation between the RCAF and Tac Avn roles and missions. In some cases, there may be a many to one correlation between the two. The relevant aspect is that the various RCAF communities and fleets will require individuals knowledgeable in both their own community / fleet operations / CONOPS and RCAF doctrine to facilitate discussion

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about roles, mission and task and how they relate to each other. The aforementioned may or may not be the same person.

- The intent is to understand any difference in terminology to ensure coherent Collective Training requirements where those requirements cross fleets (MPA and MH) and environments (RCAF – RCN). Where possible the terms should be mapped to one another so that training authorities can understand how to align roles, missions and tasks across the CAF.

- Level 2 collective training (examples from Tac Avn BTS). We recommend applying the CT Framework towards this BTS as a test run "use case". As a level 2, crew evolution, it is a relatively simple collective training requirement case that could be handled by the crew itself – useful for presenting the framework to increase understanding and utility of the framework.

- Alignment of terms – There are many operational terms with similar meanings across the RCAF, RCN and CA (e.g., Common Operating Picture (COP), Recognized Maritime Picture (RMP), Recognized Air Picture (RAP)) associated with ISR roles. An understanding of their similarities and differences may be required, especially where collective training involves two of more environments within the CAF (e.g., RCAF/ CA, RCAF, RCN) in order to derive joint collective training requirements.

- Alignment of Training Levels. There are some differences in terminology between Tactical Aviation Squadrons and the Interim RCAF Expeditionary Task Standards (AFETS) (Table 5-1 below). Level 3 through Level 5 terminology differs. The concern, from an Collective Training sense is that the training authorities might interpret these terms in such a way to confuse the focus of the training or the composition of the element(s) involved. Where different terminology is used, CAE recommends the creation of a mapping between the terms to minimize any unintended confusion. As well, examples of a notional grouping, such as the one found in Tac Avn Level 5 in Table 2, (e.g., Tactical Aviation Flight Group (a flight or armed reconnaissance helicopters augmented by 2 CH-147 helicopters)) would be helpful to understand the make-up of the grouping.

Table 5-1: Collective Training Levels

Level		TAC AVN Equivalent	Canadian Forces	Proposed RCAF (from AFETS)
2	Section, Crew and Detachment	Tactical Aviation Crew	Teams	Teams, Crew, Section
3	Sub-Subunit (Troop/Platoon) and Fd Arty Bty	Tactical Aviation Section	Sub-sub-unit	Flights

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Level		TAC AVN Equivalent	Canadian Forces	Proposed RCAF (from AFETS)
4	Subunit (Sqn, Bty and Coy) less Fd Arty Bty	Tactical Aviation Flight	Sub-Unit	Sqn/Unit/Element
5	Combined Arms Sub-unit (Cbt Tm, and Coy Gp)	Tactical Aviation Flight Group (Tactical Aviation flight combined with a flight or section of a different role and capability, i.e., a flight of armed reconnaissance helicopters augmented by 2 CH-147 helicopters)	Multi sub-unit	ATF Air Only (ACC & AEW only)
6	Unit(Regiment and Battalion and Combined Arms Unit (Battle Group and Battalion Group	Tactical Aviation Squadron	Unit	ATF Cdn JTF (ACC & AEW)

- Some BTS from Tac Avn are applicable across all RCAF fleets and can be applied across a variety of roles and missions. They are recommended as a starting point or a guide for each respective fleet where BTS do not exist. For example:
    - Conduct Tactical Aviation Battle Procedure. This procedure is a deliberate mission planning process. An abbreviated process is also specified for dynamic mission changes or time compressed planning cycles.
    - Fly Tactically. This BTS deals with flying the aircraft is such a way to increase its survivability under threat conditions and maximize the likelihood of mission success. This BTS have broad applicability across the RCAF.

5.2.2 Top Down v. Bottom Up Approach to Creating Battle Task Standards

Although the direction during this task was to propose a top down approach to collective training requirement gathering, an argument can be made, supported by the Directorate of Air Simulation and Training, for a Bottom-Up approach. The reason this bears mentioning is that Battle Task Standards do not currently exist, in name, in all RCAF fleets. As a starting point, those fleets could begin the process of drafting their BTS from their individual training

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requirements (currency or proficiency requirements) and identifying those that require crew input/cooperation. These could be rolled-up into collective proficiency requirements and compared against Concept of Operations or other Doctrinal documents to form Battle Task Standards. This is feasible initial approach to devising BTS for each RCAF fleet and the first step in this process (Section 5.1.1 – Phase 1) as individual currency requirements exist across all RCAF units.

5.3 Summary

The application of the Collective Training Requirements Framework requires some foundational work and documents. Therefore, to be used successfully, CAE recommends a two phased approach to deriving collective training requirements, namely:

Phase 1 – Creation of, or confirmation of BTS for each fleet; and,

Phase 2 – Application of Framework to formulate Collective Training Requirements.

Where Battle Task Standards do not currently exist, training authorities within those fleets can follow the first phase of the framework to formulate Battle Task Standards using a Top Down approach. This phase requires individuals knowledgeable in training, training standards and applicable RCAF doctrine, roles and missions. Storyboarding will illustrate the scenario and provide the team KSAs required for mission success. This will form the basis of how readiness will ultimately be measured. It will also form the superset a tasks and the standards to which they will be performed for collective training. [6]

Where Battle Task Standards(BTS) exist, it will be important to ensure that the existing BTS conform to RCAF doctrine, and that the terminology used in the BTS aligns with RCAF doctrine.

During Phase 2, with BTS in hand, and the applicable Managed Readiness Program(s), Managed Readiness Directive(s) and Exercise Plan(s), the framework will specify the subset of required specific missions from the overall mission set for a particulars fleets and wings. Gap analysis on the readiness of crews to perform the required mission will inform the collective training requirements necessary to meet fleet, and ultimately, RCAF mission requirements.

5.4 Conclusions

The proposed Collective Training Requirements Framework (Section 5.1) is based on a thorough review of available literature on best practices in formulating collective training requirements among Canada's current military allies and academia. It also takes into account CAF and RCAF doctrine, training documents, directive, orders and the current practice of planning collective training events.

[6] Although beyond the scope of this task, fleets could opt to perform a Bottom-Up approach to formulating BTS.

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It has been analyzed against the current Tactical Aviation Battle Task Standards and the insight gleaned from that comparison in contained in Section 5.2.

The proposed Framework has not benefitted from scrutiny and critique by RCAF standards and training subject matter experts. Discussions with both DAST and 1 CAD A7 informed the creation of this framework, but unfortunately they did not provide any feedback on the framework itself.

As a new process tool, this framework may require a guided approach during the first instances of its use. Stakeholder cooperation will be required, along with RCAF SMEs in the areas of fleet specific doctrinal roles, missions and task, along with collective training SMEs to apply the framework to derive collective training requirements.

5.5 Recommendations

CAE recommends the following actions to move the derivation of collective training requirements and this proposed Collective Training Requirements Framework ahead within the RCAF:

1. Review Framework. To date, no RCAF collective training stakeholders have reviewed this framework. CAE recommends that as many of the stakeholders identified in this document review and provide comments.

2. Collective Training Definition. There is currently no accepted RCAF wide definition for collective training. A definition is fundamental to collective training efforts. CAE recommends that a definition should be drafted and accepted by the RCAF. The framework is still useful without an RCAF definition, but the practitioners must establish a common understanding of collective training in their particular context (community, fleet, mission area) prior to proceeding with the framework.

3. Alignment of Collective Training Levels. Terminology within the described collective training levels differs between the proposed RCAF, and Tac Avn levels. CAE recommends an alignment of terms, and/or a mapping of terms between fleets, and where possible, word pictures to ensure an understanding of the elements involved in a particular level of collective training.

4. As per the DAST discussion in Section 3 of this report, a need exists to define Mission Essential Tasks (METs) required to achieve the core roles and missions of the RCAF. Several references exist within current RCAF directive and orders to bound this effort.

5. Creation of BTS. Where they do not exist, RCAF fleets should draft Battle Task Standards (BTS) before any attempt is made at utilizing this framework. Armed with METs and a BTS, the collective training stakeholders are much more likely to achieve success in deriving collective training requirements using this proposed Framework.

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6. Review of BTS. Where BTS exist, they should be compared to existing RCAF doctrine to ensure alignment with terminology and intent.

7. Along with the review of the framework proposed in the first recommendation, the application of this Collective Training Requirements Framework on a suitable test case with the appropriate CT Subject Matters Experts could further refine the framework. Application of CT requirements framework on a suitable test case to further refine and operationalize the process.

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APPENDIX A INTERVIEW QUESTIONS / DISCUSSION POINTS

1 CANADIAN AIR DIVISION (CAD) / 2 CAD / 2 WING / CFAWC

Begin with a brief description of the Task and its intended deliverables.

All questions related to aircrew training.

Emphasize that the output is a framework (Methodology/process) for determining collective training requirements – not the collective training requirements themselves.

1. What is the role of your organization with respect to:
    a. RCAF Readiness?
    b. RCAF collective training for aircrew?
2. Who governs collective training? (levels 2 through 7)
    a. Directs it?
    b. Supports it?
    c. Funds it?
    d. Implements it?
    e. Are the above mentioned entities the same across all the aircraft fleets?
3. Can you give us a description of the structure of the RCAF collective training organization and the functions(s) of the various groups/sub-groups?
4. Are there any differences to the above answers if the collective training is:
    a. Joint?
    b. Supports on particular environment? (e.g., Maritime Air, Tac Avn)
    c. Combined?
5. Is there an equivalent of COS ATA (Chief of Staff, Army Training Authority) in the RCAF? (e.g., 2 CAD? 1 CAD A7?)
    a. What role do they have w.r.t. collective training?

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6. Are there stakeholders outside of 1 and 2 CAD, 2 Wing and CFAWC that we should speak with in developing a Collective Training Requirements Framework?

7. What are there any other documents that should be references w.r.t. readiness and collective training for aircrew in the RCAF?

    a. Documents reviewed to this point:

        i. DGAFD Air Force Vectors (2014)

        ii. RFCAF Doctrine B-GA-400-000/FP-001 RCAF Doctrine

        iii. Interim Air Force Expeditionary Task Standards (2013)

        iv. B-GA-446-002/PT-001 Tactical Aviation Battle Task Standards

        v. B-GL-383-002/PS-002 Land Force Battle Task Standards

        vi. B-GL-300-008/FP-001 Amy Training for Land Operations

8. Will the collective training requirements change or evolve as new platforms and/or new platform capabilities are brought into service? (e.g., Cyclone, New fighter, CP-140 block 3/4) that changes roles).

9. Do the following documents/directives exist for each fleet within the RCAF? Groups? Wings? Squadrons?

    a. Mission Essential Task Lists (METLs)

    b. Battle Task Standards (BTSs)

    c. Concept of Employment, Concept of Operations

    d. Doctrine

    e. Standards Operating Procedures

    f. Tactics, Techniques and Procedures (TTPs)

    g. DNDAF System Views

    h. Existing Task Analysis

10. Is there an RCAF-wide definition of collective training? Readiness? What is the reference document?

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11. Is collective training a FG activity or a FD activity?

    a. Does the answer change if the training is routine, or part of a mission rehearsal?

    b. Does this differentiation matter from a collective training perspective or from a governance (Responsibility, authority, resource) perspective?

12. What organization is best suited to determine collective training requirements for each RCAF fleet?

    a. Is there an existing mechanism (standing group or similar) that would be best suited to the task?

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2 Wing Specific Questions

1. What is the role of your organization with respect to:

    a. RCAF Readiness?

    b. RCAF collective training for aircrew?

2. Definition of Air Detachment? Does it vary by fleet?

3. What is the minimum 1) Deployable; and, 2) Task-able formation for AEW operations? Does this differ for Domestic Operations?

4. Are deployed operations and AEW operations the same (from the perspective of crews)?

5. Is the 2013 version of AFETS still current?

6. AFETS list the ASAT (Army Systems Approach to Training) listed as the foundation for RCAF policy (AFETS Section 23). Is this still the case?

7. AFETS centered on the business of deploying and conducting operations as an AEW. Who is responsible for the collective training of the deployed air detachments (air dets)? Who determines the types, frequency, standards of training? Do responsibilities change from pre-deployment to training while deployed?

8. Who determines the operational employment of the air dets? Who determines the air dets readiness to meet the operational requirements? How is their readiness tracked? Can this tracking system be leverage for determining the framework for collective training requirements?

9. Is there a managed readiness plan for the various fleets w.r.t. collective training/readiness? If so, can those documents or directives be reviewed for this task?

10. Lessons Learned/Lessons Observed reports from Operations – are they being scrutinized to identify collective training requirements? How are LL/LO used to inform collective training requirements?

11. Collective training requirements – being built from Individual Training up, or post-deployment reports /doctrine/ down? Is the opposite method (bottom –up or top down) being used as a validation?

    a. Bottom–up: Take individual training and currency/proficiency evolutions and aggregate those up into collective training requirements

    b. Top-down: Take lessons Learned/lessons observed from recent operations and dissect those into relevant competencies that can be mastered through collective training.

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c. In which direction, in your opinion, should this framework be built?

12. Is collective training a FG activity or a FD activity? Does the answer change if the training is routine, or part of a mission rehearsal? Does this differentiation matter from a collective training perspective? From a governance (Responsibility, authority, resource) perspective?

13. Foundation collective training (Preparing for “A” War)

14. Is a designated common training scenario:

    a. Required (CA uses this concept)?

    b. Defined?

15. CA has an 18-24 month “refresh” timeline for training (High Readiness).

    a. Is there an equivalent in RCAF?

    b. Does this apply to the RCAF?

16. 16. How does personnel movement (in and out of units) affect this schedule (achieving readiness)? (Alternate wording – what amount of personnel turnover would prompt a refresh of collective training?)

E.g., RCN – constant movement of people in and out of the ship, however, work-ups only occur when the ship comes out of refit
Training for High-readiness – theatre specific collective training.
TMST – Theatre and Mission Specific Training

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CFAWC

1. What is the CFAWC role w.r.t:
   a. RCAF Readiness?
   b. RCAF Collective training?
2. Is there doctrine /regulation/directives related to:
   a. Readiness?
   b. Collective training?
3. Does the Lessons Learned process influence readiness requirements or collective training requirements directly?
4. Is collective training a FG activity or a FD activity? Does the answer change if the training is routine, or part of a mission rehearsal? Does this differentiation matter from a collective training perspective? From a governance (Responsibility, authority, resource) perspective?
5. Has the Virtual exercise series changed the way the RCAF determines requirements for, plans or conducts collective training?

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APPENDIX B GLOSSARY OF TERMS

This appendix contains a glossary of terms relevant to this task.

Attitude

A deeply held opinion or conviction which underlies or motivates behaviour.

CFITES Glossary A-P9-050-000/PT-01(1)

Capability

The ability to carry out a military operation to create an effect.

RCAF Doctrine B-GA-400-000/FP-001

Collective Training

The mechanism by which a commander takes a full complement of qualified soldiers – combined with time, resources, and applied TTPs – to produce competent, cohesive and disciplined organizations that are operationally deployable within realistic readiness timeframes.

Training for Land Operations (B-GL-300-008/FP-001), 2014

Training, other than Individual Training and Education, designed to prepare sub-teams, teams and units to perform military tasks in accordance with defined standards. Collective training includes procedural drill and the practical application of doctrine, plans and procedures to acquire and maintain tactical, operational and strategic capabilities.

RCN Collective Training Strategy Policy and Guidance, 2016

CFITES Glossary A-P9-050-000/PT-01(1)

Doctrine

Fundamental principles and proven practices by which military forces guide their actions in support of objectives. Doctrine is authoritative but requires judgment in application.

RCAF Doctrine B-GA-400-000/FP-001

Force Generation

The process of organizing, training and equipping forces for force employment.

Air Force Vectors, 2014

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RCAF Doctrine B-GA-400-000/FP-001

Knowledge

The theoretical and/or practical understanding of a subject matter required to perform work.

CFITES Glossary A-P9-050-000/PT-01(1)

Measure of Effectiveness (MoE)

A MoE is concerned with assessing a system's ability to achieve its goal; its impact on the operational environment. In this respect, a MoE tends to be more complex than a MoP and may include two or more MoPs in its determination. A MoE focuses on a holistic assessment of how well the system performs overall and can be considered an overarching measurement that comprises more than one MoP.

Adapted from Roedler & Jones, 2005; and the Test and Evaluation Management Guide, 2005

Measure of Performance (MoP)

A MoP is a quantifiable measurement that can take any number of forms, such as a simple count of something, a physical measurement, an average, a rate, or a percentage. A MoP may be stated as a declarative statement and indicates a system's achieved level of performance. A MoP does not provide an assessment of the overall impact of the measurement attribute on the goal of the system. A MoP focuses on the absolute measurement of unidimensional qualities.

Adapted from Roedler & Jones, 2005, Test and Evaluation Management Guide, Defense Acquisition University, 2001

Operational Readiness

The capability of a unit/formation, ship, weapon system or equipment to perform the missions or functions for which it was organized or designed.

Air Force Vectors, 2014

Readiness

Preparedness to respond to government direction, encompassing the resources needed to maintain equipment, conduct training, and prepare units for operations.

RCAF Doctrine B-GA-400-000/FP-001

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Training

An activity that aims to impart specific skills or knowledge and/or appropriate attitudes required in the performance of assigned duties.

CFITES Glossary A-P9-050-000/PT-01(1)

Training Levels

1. Individual	1
2. Teams	> 25
3. Sub-sub Unit	> 50
4. Sub-Unit	> 150
5. Multi Sub-Units	> 500
6. Unit	> 1000
7. Formation	> 3000
8. Region / Task Force	>5000
9. Command >	
10. Strategic	

Excerpt from CF Collective Training Standing Guidance, Annex B
Collective Training Framework, Cheif of the Defence Staff, 2009

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This proposed Collective Training Requirements Framework (Section 5.1) is based on a review of the available literature on best practices in formulating collective training requirements. It also takes into account CAF and RCAF doctrine, training documents, directive, orders and the current practice of planning collective training events.

The work is in support DRDC Toronto Research Center in its role to provide advice to the Director Air Simulation and Training on the use of simulation for collective training. This proposed framework supports the goal of developing a framework to derive collective training (CT) requirements from the core roles of the Royal Canadian Air Force (RCAF).

CAE describes the underlying supporting concepts and the approach used to generate the framework in Section 2 – Approach. The analysis phase of this work follows in Section 3 – Analysis and comprises two main activities: information gathering followed by a detailed review, assessment and synthesis of the information gathered. Section 4: Design, describes the design of the resulting framework.

The Framework is applied in two phases. Where Battle Task Standards (BTS) currently exist, Phase 1 will guide practitioners through ensuring that the BTS for all mission(s) are current and comply with RCAF doctrine (Figure 5.1). Where they do not exist, Phase 1 begins with doctrinal mission storyboarding, followed by the analysis of collective tasks to determine which of them require Knowledge, Skills and Attitudes (KSAs) that can only be trained collectively. This process is carried out with a mind to how mission success can be evaluated, in order to inform the composition of the required measures of effectiveness. Once the BTS is established, it becomes the authoritative reference for the standards that must be met for the “superset” of doctrinal missions mandated by the RCAF to the respective community, fleet, or warfare area.

Phase 2 focuses on deriving Collective Training requirements for a specific mission or prescribed readiness level, using the established BTS as a basis. The RCAF formulates a Managed Readiness Program (MRP) based on the Joint MRP, Commanders RCAF’s High Readiness Directive and the annual Collective Training Exercise Conference (CTEC) chaired by Commander 1 CAD. The primary output of the CTEC is the annual Exercise Plan for the RCAF.

From the RCAF Exercise Plan, commanders and training authorities can identify specific mission types that will be the focus of training along with their associated BTS. This BTS subset defines the target performance state for the corresponding collective (team / air detachment / air task force). A gap analysis then compares the target performance state (readiness state) against the current performance state for all the RCAF units designated to form the collective (team / air detachment / air task force). Any identified deficiencies represent the collective training requirements.

The results of discussion with two collective training stakeholders, namely the Directorate of Air Simulation and Training and 1 Canadian Air Division A7 informed the creation of the framework. However, the proposed framework did not benefit from extensive review and comment from within the RCAF collective training community. Further dissemination amongst stakeholders is recommended with requests for feedback to improve and operationalize the framework.

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

Simulation, training, learning, collective training