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EVALUATION OF THE DND/CF AMMUNITION ACQUISITION PROGRAM

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CAVEAT

This evaluation is not intended to assess the performance of contractors; rather, it is an internal review of processes and practices within the DND/CF.



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LIST OF ACRONYMS

AAP	Ammunition Acquisition Program
ADM(IM)	Assistant Deputy Minister (Information Management)
ADM(Mat)	Assistant Deputy Minister (Materiel)
ASCB	Ammunition and Sonobuoy Control Board
AIMS	Ammunition Information Management System
CANOSCOM	Canadian Operational Support Command
CFSS	Canadian Forces Supply System
COS(Mat)	Chief of Staff (Materiel)
C Prog	Chief of Programme
CRS	Chief Review Services
DASPM	Director Armament Sustainment Program Management
DAVPM	Director Armoured Vehicle Project Management
DCDS	Deputy Chief of the Defence Staff
DFAIT	Department of Foreign Affairs and International Trade
DGAEPM	Director General Aerospace Equipment Program Management
DGAPM	Director General Ammunition Program Management
DGIIP	Director General International and Industry Programs
DGMEPM	Director General Maritime Equipment Program Management
DGMSSC	Director General Materiel Systems and Supply Chain
DLP	Director Land Procurement
DND/CF	Department of National Defence/Canadian Forces
DSS	Department of Supply and Services
ECS	Environmental Chief of Staff
FC	Fixed cost
FMAS	Financial Managerial Accounting System
FMS	Foreign military sales
GoC	Government of Canada
HR	Human resources
IC	Industry Canada
LCU	Land & Common User
MASOP	Materiel Acquisition and Support Optimization Project
METC	Munitions Experimental and Test Centre
MSP	Munitions Supply Program
NDHQ	National Defence Headquarters
NP	National Procurement
OAG	Office of the Auditor General
PWGSC	Public Works and Government Services Canada
R&D	Research and development
UOR	Unforecasted operational requirement
VCDS	Vice Chief of the Defence Staff



RESULTS IN BRIEF

This report presents the results of a Chief Review Services (CRS) evaluation of the Department of National Defence/Canadian Forces (DND/CF) Ammunition Acquisition Program (AAP). Under the current program construct, the AAP serves to meet the recurring training requirements of the CF for existing ammunition technologies.

The AAP is funded under the DND/CF National Procurement (NP) Program. AAP expenditures were \$184.2M in 2004/05.¹ Expenditures include the cost of maintaining a Canadian industrial capability for ammunition production under the Munitions Supply Program (MSP).² AAP funding does not provide for the acquisition of operational stocks (opstocks) or new ammunition capability.

Central to ammunition procurement is ensuring that this critical commodity is available to the CF when needed. The high cost of ammunition and competing defence priorities also require that ammunition procurement be cost-effective. The fact that ammunition is a vital, expensive, complex, high-volume, dangerous, and long-lead-time commodity adds to the challenge of the ammunition procurement function.

Factors contributing to the decision to conduct this evaluation include continuing pressure on NP funding and senior leadership concerns regarding the reasonableness of ammunition procurement expenditures and the adequacy of the program management framework.

Key Observations and Findings

Governance and Organization. The division of responsibilities for various facets of ammunition management amongst service providers, force generators, force employers, the Vice Chief of the Defence Staff (VCDS), and others are unclear (e.g., responsibilities for opstock holding levels, training requirements validation, and the management of the MSP). Successive reorganizations have left responsibilities increasingly fragmented across different organizations

Overall Assessment

- The management framework for ammunition planning and acquisition has deteriorated over the past decade as a result of reorganizations, downsizing and inattention, and is not sufficient to ensure that program objectives are achieved.
- Unclear responsibilities combined with business processes that are not visible, understood, or observed contribute to inefficiencies, delays and lack of accountability throughout the ammunition planning and acquisition system.
- The AAP continues to be based on an early post-Cold War planning model geared to peacetime requirements and stable and predictable ammunition demand.
- A less forgiving planning environment, characterized by increased uncertainty and CF engagement in combat roles, compounds AAP weaknesses.
- Weaknesses in ammunition planning and acquisition processes have caused delays in the acquisition of needed ammunition as well as the procurement of unnecessary ammunition and possibly other related capability.

¹ AAP expenditure data was provided by the Materiel Group.

² The reasonableness of expenditures on the MSP are included in this report as part of the assessment of the reasonableness of AAP expenditures. Other MSP evaluation issues, including MSP performance, relevance, design and delivery, will be addressed in a separate CRS report, *Evaluation of the Munitions Supply Program (MSP)*.



and at lower organizational levels, with no clear centre to provide strategic direction and to ensure that the various organizational piece parts work effectively as a system. In addition, the organizational entity established in the mid 1990s to provide executive direction for ammunition (the Ammunition and Sonobuoy Control Board (ASCB)) is no longer designed and staffed to service this role. The entity has since been renamed the Ammunition and Sonobuoy Working Group and serves largely as a forum for the exchange of information at working levels.³

Business Processes. Business processes for ammunition requirements determination, acquisition, and resource allocation are not aligned, creating disconnects throughout the system. Requirements determination, the front-end process that drives ammunition procurement, is characterized by indecision and delays. Requirements plans are submitted too late in the procurement cycle and are repeatedly revised and resubmitted to procurement staff at relatively junior levels (i.e., captain/major or equivalent) with no formal handoff to signal a clear decision point as to which plan is the final approved plan and who is accountable. Mechanisms are not in place to ensure coordination among stovepiped activities within the requirements determination process (e.g., procedures do not exist to ensure that requirements planners are systematically advised of anticipated changes in weapon platforms or doctrine that impact future ammunition requirements). Ammunition procurement is also out of synch with the NP resource allocation process since procurement contracts extend out farther than funding has been committed.

Program Scope. Under the current program construct, AAP planning and acquisition efforts are limited to training requirements. Ammunition opstock and industrial capacity requirements are examples of issues that diminished in importance throughout the 1990s. Attention to these areas continues to be insufficient in view of their direct and indirect impacts on AAP expenditures and due to their criticality to DND/CF ammunition readiness. In response to continuing concerns by force generators and employers regarding inattention to opstocks, the VCDS, in July 2005, initiated a multi-disciplinary working group to examine opstocks. Working group activity to date has focused on opstock planning tools.

Planning Horizon. The planning horizon for ammunition requirements has become too short and reactive for the procurement system to accommodate. In addition, a longer-term strategic perspective on requirements, which is needed to guide decision making (e.g., inventory levels, amount and type of industrial capability to maintain, research and development (R&D)), has not been developed since 1999.

Information for Decision Making. The absence of adequate management information to support fact-based decision making has been a longstanding shortcoming of the AAP. For example, complete, timely, and reliable information that provides full visibility of ammunition assets, usage, and prices is not available. As recently as 2002, program staff depended on a manual card system to track ammunition through the supply system. While considerable progress has been made in recent years to overcome longstanding deficiencies, information for decision making remains insufficient.

³ Since completion of the CRS study, it was identified that a new consolidated Ammunition Board co-chaired by Chief of Programme (C Prog) and Chief of Staff (Materiel) (COS(Mat)) is to be formed.



Reasonableness of Expenditures on Ammunition. In terms of the reasonableness of quantities of ammunition procured, program staff stated that up until the early 1990s, there were instances where more ammunition was procured than needed to satisfy requirements in order to support MSP suppliers (e.g., 155MM Propelling Charges, CRV-7). A 1988 OAG study also concluded that the MSP caused the DND/CF to procure ammunition beyond its requirements. More recent data indicates that the practice of supporting MSP suppliers by procuring excess ammunition does not appear to have occurred to any material extent since the 1990s. However, disconnects in the ammunition planning has resulted in the unnecessary procurement of ammunition (e.g., 105MM High Explosives Extended Range, M72 VSAW sniper ammunition). Also, while complete and reliable information on usage trends was not available, limited data for the three-year period 1999 to 2001 shows that annual usage rates ranged from approximately 65 percent to 80 percent of stated requirements, suggesting that ammunition requirements plans tend to be overstated. Furthermore, while the MSP may not have caused the unnecessary procurement of ammunition in recent years, there are indirect indicators that MSP expenditures may be too high in other respects (e.g., amount of industrial capacity supported by the Crown).

Implications

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..... Alternatively, program weaknesses have resulted in the unnecessary procurement of ammunition, which diverts resources from other defence priorities. Indecision and delays in ammunition planning are also compromising commitments to suppliers and Public Works and Government Services Canada (PWGSC).

Recommendations

Establish a management framework for ammunition planning and acquisition that reflects modern comptrollership principles and the current DND/CF operating environment. All facets of the AAP management framework need to be strengthened. A more strategic, integrated, and operationally focused approach to ammunition planning and acquisition governance is needed. Program scope should consider all dimensions of ammunition requirements, not just training ammunition (e.g., requirements for ancillary ammunition services, industrial capacity, opstocks). Responsibilities and accountabilities need to be clarified and a detailed responsibility matrix developed. Business processes need to be clarified and aligned with appropriate handoff mechanisms put in place. Processes should be designed with a view to reducing the overall cycle time for ammunition planning and acquisition. Risk management practices need to evolve to reflect the unpredictability of the current security environment and to ensure that senior leadership is kept apprised of program risks. Improvements to management information systems need to continue in order to ensure that timely, complete, and accurate information is available to support decision making.

Note: For a more detailed list of CRS recommendations and management response, please refer to [Annex A](#)—Management Action Plan.



INTRODUCTION

Overview

- Ammunition is a military commodity that includes the full spectrum of explosive devices from small arms ammunition, to grenades and pyrotechnics, to complex missiles and torpedoes as well as sonobuoys.
- Procurement involves the policies, processes, activities, resources, and organizations required to translate a defined requirement into goods and services.
- The fact that ammunition is a vital, expensive, dangerous, high-volume, long-lead-time, and politically sensitive commodity adds to the complexity of the ammunition procurement function.
- Factors contributing to the decision to evaluate ammunition procurement include:
 - Increased pressure on DND/CF NP funding and the materiality of ammunition within the NP program; and
 - Ongoing concern by DND/CF senior leadership that expenditures on ammunition procurement are too high.

Study Scope

- The focus of this study is the DND/CF AAP.
- Ammunition requirements determination, which is the front-end process to ammunition procurement, has been examined to a limited extent due to its impact on procurement activity.
- The acquisition of new ammunition capability through stand-alone capital projects is outside the scope of this study.

Study Purpose

- This study assesses the adequacy of the management framework and the reasonableness of expenditures for the AAP.



Methodology

- Quantitative and qualitative information used in the study was obtained from a number of sources including:
 - Directed interviews (DND, other government departments, industry, allies);
 - Documents and records;
 - Internal and external publications; and
 - Corporate information systems (Canadian Forces Supply System (CFSS), Financial Managerial Accounting System (FMAS), Ammunition Information Management System (AIMS), Ammo Plan).
- Evaluation indicators and criteria were derived from procurement policy and best practices and other program material.
- A conceptual model was developed to evaluate the reasonableness of ammunition quantities procured.
- Study findings and conclusions are based primarily on observations and data over a study period from the mid-1990s to 2005.



PROGRAM PROFILE

Background

- The AAP serves to meet the recurring training requirements of the CF for ammunition technologies currently in service.⁴
- Currently, the AAP addresses the types and quantities of ammunition required for steady state, transition, and in-theatre training forecasted by force generators in their annual requirements plans.⁵
- Annual AAP expenditure levels from 1995/96 to 2004/05 are shown in Figure 1.
- AAP expenditures include the maintenance of a domestic ammunition industrial base under the MSP.
- Ammunition is procured domestically from MSP suppliers and offshore through foreign military sales (FMS) and direct commercial buys.
- MSP suppliers have received an average of approximately 75 percent of AAP expenditures over the past five years.
- Ammunition requirements and procurement have been trending downward since the end of the Cold War, consistent with trends seen in allied nations.
- While there has been a slight upswing in ammunition procurement under the AAP in recent years, procurement levels remain significantly below Cold War levels.
- Land & Common User (LCU) ammunition represents the largest share of AAP expenditures.

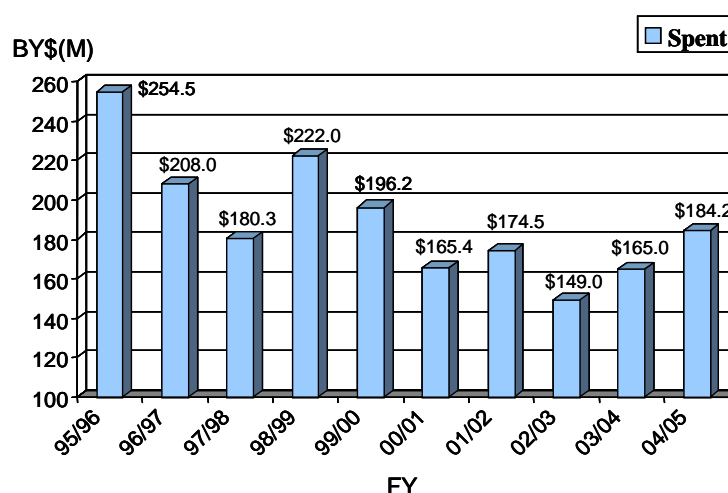


Figure 1. Historic AAP Expenditures. Annual AAP expenditures from FY 1995/96 to FY 2004/05.

⁴ New ammunition capability is typically acquired through stand-alone capital acquisition projects.

⁵ Unforecasted requirements are either absorbed through existing funding or funded separately from the centre.



Program Rationale and Expected Results

- A dependable and affordable supply of ammunition is essential to the achievement of defence outcomes—namely, the generation and deployment of operational forces.
- Ammunition acquisition is one of a number of supply functions required to ensure that the right ammunition is available to the CF in the right quantity, at the right time, in the right place, and at the right price.
- The overarching objective of any DND/CF procurement activity, including the AAP, is to satisfy requirements at the least cost.
- This involves maintaining an appropriate balance between the risk of stock-outs and the cost of excess procurement.
- Safety stocks should be as low as possible, with only a sufficient buffer to avoid interruptions in supply to the CF in the event of unforeseen occurrences (e.g., unexpected increase in demand, delivery delays).⁶

Program Activities

- The procurement process starts when requirements are identified and ends with product acceptance.
- Procurement activities include:
 - Procurement planning,
 - Technical support (e.g., design, specification, engineering),
 - Source selection,
 - Contract management (e.g., negotiation, award, performance monitoring, payment, administration),
 - Safety and quality assurance, and
 - Acceptance.
- Acquisition decisions consider factors such as procurement lead times, requirements, inventory holdings, minimum order quantities, offshore production windows, and the planned phase-out or introduction of weapons systems.
- A program logic model illustrating the linkages among program objectives, activities, and outcomes is provided in [Annex B](#).

⁶ Safety stocks (which support ongoing activities such as training) should be distinguished from opstock holdings. While safety stocks should be as low as possible while avoiding stock outs, opstocks (which are reserved for use in the event of conflict) should be held to the maximum level authorized by opstock holding policies and that funding permits.



Program Organization and Governance

- Responsibilities for ammunition procurement are distributed primarily between the DND/CF and PWGSC—though Industry Canada (IC) and the Department of Foreign Affairs and International Trade (DFAIT) also have roles.
- The Assistant Deputy Minister (Materiel) (ADM(Mat)) is responsible for procuring goods and services funded under the NP Program.
- A reorganization of the Materiel Group in 2004 placed most ammunition procurement activity under the Director Armament Sustainment Program Management (DASPM)⁷—though other Materiel Group Divisions also have roles in ammunition procurement (e.g., Director General Maritime Equipment Program Management (DGMEPM), Director General Aerospace Equipment Program Management (DGAEPM), Director General Materiel Systems and Supply Chain (DGMSSC), and Director General International and Industry Programs (DGIIP)).
- Environmental Chiefs of Staff (ECSs) are responsible for defining their requirements in the most economic manner and ensuring that requirements are within available funding.
- The VCDS approves funding allocations.
- PWGSC serves as the contracting authority for the Crown and is responsible for ensuring best price.

⁷ Since completion of this study, ammunition procurement activities were moved from DASPM to the Director Armoured Vehicle Project Management (DAVPM) and to the Director Land Procurement (DLP).



DETAILED FINDINGS

AMMUNITION REQUIREMENTS DETERMINATION

An ammunition planning process characterized by informality, indecision, delays, and lack of accountability is driving approximately \$200M in recurring procurement for a vital military commodity. Deficiencies in ammunition requirements determination processes are adversely impacting downstream procurement activities, putting the timely and cost-effective acquisition of ammunition at risk. The quality, scope, and timeliness of requirements plans need to be improved and a more robust planning system is needed to respond to the current operating environment.

Role of Requirements in Ammunition Procurement

The ammunition acquisition system depends on reasonable and timely statements of requirements.

- Requirements determination is the front-end process that drives the ammunition acquisition system.
- Under the current program construct, force generators are responsible for annually updating their ammunition requirements forecasts so that the Materiel Group can prepare and execute procurement plans to restock the depots.
- With National Defence Headquarters (NDHQ) devolution in the late 1990s, force generators assumed control over funding and have the discretion to establish their own priorities for ammunition and other equipments needs.⁸
- The Materiel Group is limited to procuring those ammunition items that force generators identify in their requirements plans and which they are prepared to fund.⁹
- Since ammunition is a long-lead-time commodity, requirements must be identified well in advance (at least 18 months for conventional ammunition procured domestically and two to three years or more for complex ammunition procured offshore).
- In addition, a longer-term strategic view of the direction of ammunition requirements is required to support procurement decision making (e.g., inventory levels, industrial capacity, R&D, warehousing and distribution infrastructure).
- Statements of requirements also serve a role in the management control framework to ensure that procurement is justified and that accountability for the procurement decision is clear.

⁸ Prior to NDHQ devolution, ADM(Mat) controlled the ammunition budget centrally.

⁹ Ammunition procurement management differs from other commodities where the Materiel Group manages a steady state activity budget with automated replenishment.



Business Processes

Requirements determination is out of sync with the procurement cycle and handoffs between requirements and procurement processes are inadequate.

- Force generators are submitting plans too late in the procurement cycle (e.g., after procurement contract negotiations have commenced or contracts have been let).
- Requirements plans are repeatedly revised and resubmitted at relatively junior levels (i.e., captain/major or equivalent) with no formal handoff to signal a clear decision point as to which plan is the final approved plan and who is accountable.
- Requirements plans (and thus procurement plans) were not developed for the 2002 production year, leaving the primary ammunition supplier to speculate on DND/CF requirements.
- Systems for prioritizing ammunition requirements have not matured (likely due to a history of funding ammunition requirements at 100 percent), further contributing to delays and inefficiencies in requirements determination.

In addition to disconnects between the requirements determination and procurement processes, gaps within the requirements determination system itself prevent the system from functioning effectively.

- Stovepiped planning activities (e.g., for training requirements, technology development, doctrine, and resource management) are not adequately linked to ensure that ammunition requirements planners are systematically advised of decisions in other parts of the system (e.g., the retirement or introduction of weapons from service).
- Lack of coordination between those responsible for technology development and those responsible for determining ammunition requirements, funding, and priorities has also resulted in inefficient use of technology development resources (e.g., several years and significant resources were invested to develop a 76MM smoke grenade only to discover down the line at the production stage that the item was not affordable and not a priority).

Some requirements practices, which have in the past adversely impacted ammunition procurement, have recently been remedied.

- The VCDS has prohibited the ECSs from redirecting approved ammunition funding allocations to other uses.
- The land force has restricted the widespread practice of units “swapping” ammunition types requested in their requirements plans for other ammunition items throughout the training year.



Planning Scope

Ammunition requirements planning efforts are limited to training, which is too narrow in the current environment.

- Opstock holding requirements have not been subject to a system-wide review since the first half of the 1990s, despite ongoing calls from force generators and force employers to conduct such a review.
- Individual Environments have made some efforts to update holding policies (e.g., air force revised holding policies post-Kosovo).
- Unclear roles and responsibilities for opstocks combined with a lack of funding to address opstock deficiencies have likely contributed to inattention to opstocks.
- In July 2005, the VCDS initiated a multi-disciplinary working group to examine opstocks.
- Working group activity to date has focused on operational planning tools.

Ancillary ammunition services and industrial capability, which represent a growing share of AAP expenditures, are also not adequately addressed as part of the requirements determination process.

- Some ammunition support activities traditionally performed within the Materiel Group and funded through ADM(Mat) O&M resources (e.g., technical support, configuration management, sourcing) have migrated over the years to industry and are now funded under the AAP.
- Procurement of these services is not supported by statements of requirements nor is this part of a broader strategy or business case that defines the role of industry beyond ammunition production.
- Nor have statements of requirements been developed to justify the level of DND/CF expenditures on industrial production capacity (e.g., types and quantities of industrial capacity that the Crown wishes to maintain beyond current production levels to meet self-sufficiency, surge and readiness objectives).

Planning Horizon

The planning horizon for ammunition requirements determination is too short and does not provide the longer-term perspective needed to guide strategic decision making.

- Agreements with suppliers and PWGSC call for the annual submission of a five-year procurement plan (with the first two years of the plan to be firm and the remaining three years provided for planning purposes) plus a strategic outlook for longer-term requirements.



- In practice, the DND/CF has had difficulty deciding on and submitting requirements plans for even the initial planning year and has not honoured the commitment to provide a firm two-year plan.
- A longer-term strategic outlook for ammunition requirements has not been developed since 1999.

Planning Tools, Methods and Assumptions

Planning tools, assumptions, culture, and skills are amongst factors impacting the quality of ammunition requirements plans.

- A detailed assessment of requirements determination practices was not part of this study, though a limited review revealed areas requiring improvement.
- A number of interviewees expressed concern that requirements determination had become increasingly a budget-driven rather than needs-based exercise and that requirements had been so “scrubbed down that we have lost sight of actual underlying requirements.”
- Requirements planners stated that historically requirements have been based on the assumption that all training courses would occur and that these would be filled to 100 percent capacity (even though this was rarely the case).
- Force generators indicated that they were not prepared to bear the risk of identifying requirements at less than 100 percent course fill.
- Even if planners were motivated to consider historic usage trends in order to develop requirements plans that are more reflective of past experience, information and tools are inadequate to perform needed variance analysis (e.g., complete and reliable information on ammunition usage is not available).
- The land force’s past practice of allowing widespread “swapping” for ammunition types not identified in requirements plans reduced the incentive to develop reasonable plans, since units did not have to live with what was identified in their plans.
- The adequacy of skills and experience of requirements planners was raised as an issue by a number of study interviewees.

Implications for Ammunition Procurement

- Delays and uncertainty in the requirements determination process:
 -
 - Increase the risk that ammunition will be procured unnecessarily (e.g., where requirements have been revised downward after contracts are let or where requirements planners are not advised of plans to remove or reduce weapons systems); and
 - Prevent the DND/CF from honouring time commitments to suppliers and PWGSC for finalizing procurement plans, in turn, undermining agreements and good will with program delivery partners.

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- The absence of underlying requirements to support the procurement of industrial capability and ammunition services:
 - Prevents determination if DND/CF is procuring appropriate amounts and types of capacity and services;
 - Reduces the visibility and accountability for the procurement decision; and
 - Leaves suppliers to speculate on where they should direct their efforts to best serve DND/CF interests.
- Inattention to opstocks requirements:
 - and
 - Prevents cost-effective management of the AAP (e.g., ongoing review of opstock requirements may allow holdings to be freed up for training use, saving the procurement of training ammunition).
- Insufficient visibility of longer-term requirements reduces opportunities for procurement planners, life cycle managers and industry to make adjustments in order to realize efficiencies and to respond to DND/CF future needs (e.g., industrial capacity, R&D, warehousing and distribution systems).

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AMMUNITION ACQUISITION PROGRAM DESIGN AND DELIVERY

The AAP management framework is inadequate in view of the materiality of the commodity. Governance, business processes and other elements of the APP management framework have eroded after years of reorganizations, staff turnover, and inattention, and have not evolved to reflect changes in the DND/CF internal and external operating environment. In addition, a less forgiving planning environment, characterized by increased uncertainty, CF engagement in combat roles, and depletion of large surplus ammunition stockpiles compounds weaknesses in the AAP management framework, putting AAP performance at risk.

Program Assumptions

The AAP is founded on the assumptions and findings of a Zero-base Review conducted during the early post-Cold War period.

- The Zero-base Review established baseline funding for the AAP at a level needed to sustain peacetime steady-state training requirements, at a reduced level of readiness.
- No funding was provided to address opstock deficiencies identified by the Zero-base Review.
- Nor was funding provided for ammunition required to transition to a high state of readiness prior to deployed operations.
- The Zero-base Review assumed that force generators could draw on large excess ammunition stockpiles from the closure of CF Europe to absorb new requirements such as transition requirements and to reduce pressure on AAP funding for the coming years.
- While the funding baseline established by the Zero-base Review has lost relevance over time, the current ammunition planning system continues to depend on a relatively high degree of stability and predictability in demand.

Program Scope

Since the end of the Cold War, the AAP has lost operational focus and today is concerned exclusively with training requirements.

- AAP staff in the Materiel Group continued to serve as a centre of expertise for opstocks until the late 1990s.
- AAP staff occasionally exercised discretion to “top up” opstocks if funding flexibility allowed (though this practice ceased in the late 1990s when responsibility for ammunition funding was devolved from ADM(Mat) to the ECSs).



- At some point AAP management determined that opstocks were outside their domain—a decision that was made even though attention to operational requirements is also required to ensure cost-effective management of other aspects of the AAP (e.g., procurement of training ammunition and industrial capacity).¹⁰
- Attention to matters of ammunition industrial readiness also ceased during the 1990s.

Years of inattention to opstocks and ammunition industrial capacity have left gaps in corporate knowledge and management processes.

- Processes are not in place to ensure that opstocks holding requirements remain current in the face of changes in the CF operating environment.
- Policies pertaining to opstock holdings and replenishment have not been developed.
- Risk management and reporting mechanisms are not in place to provide visibility and understanding of gaps in ammunition operational capability.
- Management information for opstocks is inconsistent and uncertain due to discrepancies in the use of terminology (e.g., opstocks, reserve stocks, transition stocks) and due to the informality with which information is managed.

Program Governance and Organization

Successive reorganizations have left gaps in responsibilities and accountabilities for ammunition planning and acquisition.

- Responsibility for various facets of the ammunition program changed hands amongst the Deputy Chief of the Defence Staff (DCDS), VCDS, ADM(Mat), and ECSs at different points in the latter half of the 1990s.
- An NDHQ Instruction dated 12 October 1995 finalized the transfer of ammunition responsibilities from the DCDS to VCDS, providing the VCDS “with overall management of the ammunition program.”
- In 1997, the VCDS, in turn, delegated responsibility for “ammunition management” to ADM(Mat).
- The 1997 direction also stated that the “actual users of the ammunition (the ECSs) would set their own priorities and deal directly with the central service provider—ADM(Mat).”
- Over the same period, more broadly based organizational change was occurring to re-engineer NDHQ toward a more devolved corporate model for resource management, which saw control of ammunition funding go from ADM(Mat) to the ECSs.

¹⁰ Ammunition that is surplus to opstock levels may be made available for training and reduce expenditures on training ammunition.



- Detailed instructions and responsibility matrices have not been developed to clarify the division of responsibilities for “ammunition management” amongst service providers, force generators, and force employers, the VCDS, and others as a result of organizational changes (e.g., responsibilities for opstock levels, requirements validation, and the MSP).

In addition to broader corporate restructuring, the ammunition program itself has undergone multiple reorganizations since the late 1990s that have left ammunition functions increasingly fragmented and with reduced organizational profile.

- Responsibilities for ammunition are now distributed across different chains of command both within the Materiel Group (e.g., DASPM,¹¹ DGMEPM, DGAEPM, DGMSSC, DGIIP) and in other DND/CF organizations (e.g., Canadian Operational Support Command (CANOSCOM), VCDS).
- Reorganizations have also seen the first line of dedicated management for ammunition decline in organizational stature from a director general level in the 1990s to a section head level today.
- Reorganizations in the past two years stemmed first from the Materiel Acquisition and Support Optimization Project (MASOP) and then from CF Transformation.
- Reorganizations have left ammunition responsibilities and authorities increasingly fragmented without establishing organizational mechanisms to ensure that the various piece-parts work effectively as a system and without a focal point for strategic direction.
- Fragmented and stovepiped roles complicate relationships and interfaces with program customers (ammunition users) and external program delivery partners (e.g., PWGSC, industry).

The organizational entity established to govern the AAP no longer serves this role.

- A 1995 VCDS instruction identified that ammunition requires careful control and management at all levels due to the cost and complexity of the commodity and due to its criticality to combat readiness, training, and the defence program.
- The ASCB was established in 1995 as a forum to provide executive direction for ammunition planning, acquisitions, and expenditures.
- The ASCB mandate was to include modifications to transition and opstocks not previously identified with the introduction of new capital equipment.
- The ASCB was to be chaired by the then Director General Force Development/Director Force Structure of the VCDS Group and be co-chaired by the Director General Ammunition Program Management (DGAPM) from the Materiel Group.
- The ASCB would brief the Program Control Board/Defence Management Committee each September on the status of the ammunition sonobuoy program.

¹¹Since completion of this study, ammunition procurement activities were moved from DASPM to DAVPM and DLP.



- The mandate of the ASCB was not revised with the transfer of responsibility for “ammunition management” from the VCDS to ADM(Mat) or with NDHQ corporate devolution.
- Since the late 1990s, the ASCB diminished in scope and authority.
- The ASCB, which underwent successive name changes, has long lost its strategic focus and is no longer designed or staffed to play an executive decision-making role.¹²
- The entity now functions primarily as a working group for information exchange, with participation primarily at junior officer and major levels (and equivalent maritime and civilian levels).
- There is uncertainty and lack of consensus as to the current role and mandate of this entity.

Business Processes

Inadequate process management is adversely impacting program performance.

- The ammunition acquisition process is not in sync with other corporate business processes on which it depends.
- Inadequate alignment and handoffs with the ammunition requirements determination process is adversely impacting the procurement system.
- The ammunition procurement system is also out of sync with the NP resource allocation process, since procurement contracts extend out further in time than funding has been committed.
- The overall system and interrelated piece parts are not sufficiently clear and understood by program stakeholders.

Processes for planning and acquiring ammunition for operational requirements have not been reviewed or updated to reflect the current CF operating environment.

- After decades of assumed peace and limited CF engagement in combat roles, processes for opstock replenishment have lost visibility.
- Program staffs were unaware of procedures for funding and replenishing ammunition for CF deployments in 2002/03.
- It was ultimately determined that the unforecasted operational requirement (UOR) process would be used.
- The UOR process is designed to respond to unforeseen operational needs and to replenish stocks after they have been consumed in operations.

¹² Since completion of the CRS study, it was identified that a new consolidated Ammunition Board co-chaired by C Prog and COS(Mat) would be formed.



- As such, the UOR process is better equipped to respond to ad hoc needs rather than to sustain a supply of stock in support of ongoing combat efforts—particularly for a long-lead-time commodity such as ammunition.

Information for Decision Making

Management information systems are not adequate to support fact-based procurement decisions—though considerable progress has been made in recent years to overcome longstanding deficiencies.

- Deficiencies in management information tools have plagued ammunition management for years.
- As recently as 2002, staff remained dependent on a manual card system to manage ammunition assets.
- Information systems modules for ammunition that were to be developed as part of the upgrade to the CFSS did not materialize, leaving the ammunition program to fend for itself.
- Roll out of a stand-alone ammunition inventory management system, the AIMS, commenced in 2002.
- While a significant improvement over the manual card system, AIMS does not provide full asset visibility (i.e., limited to second- and third-line ammunition holdings); nor does it provide usage or price information.
- Systems upgrades are planned to address information deficiencies in AIMS.
- Program staffs lack confidence in the ability of the CFSS to provide reliable and timely information on ammunition holdings.
- CFSS ammunition price information is not perceived to be reliable for a range of reasons (e.g., lack of control over price field in CFSS, distortions in ammunition prices caused by changes in methodology to include or exclude MSP overhead costs in ammunition unit prices).
- The existence of two parallel information systems (AIMS and CFSS) results in duplication of effort in the administration of ammunition throughout the supply system.
- Procedures are not in place to ensure that information contained in other standalone electronic planning tools for determining ammunition procurement quantities (Ammo Planner) remains current.
- The reliability of information contained in systems is dependent on timely updates to systems by supply staff and adequate controls over information fields; staff noted that improvements were required in both these areas.



Business cases or other supporting analysis are not being developed to justify procurement expenditures.

- Volume purchase decisions (or “opportunity buys”) are not supported by business cases that demonstrate that the additional cost and risk of procuring and carrying quantities that exceed current requirements is justified by a lower unit price.¹³
- Related to the above, ammunition carrying costs and risks are not sufficiently understood to facilitate informed procurement decisions on opportunity buys.

Risk Management

Risk management culture and practices are not sufficiently evolved for this critical, costly, and long-lead-time military commodity.

- Risk management for ammunition acquisition should involve ensuring that CF needs can be met in the event of minor or major interruptions in supply or minor or major changes in demand—giving due consideration to cost-risk trade-offs.
- The basic elements of an ammunition supply system are in place:
 - Safety stocks (inventories) for training ammunition provide a limited cushion for minor unforeseen events (e.g., more consumed in training than anticipated, delays in contractor shipments).
 - Opstocks exist to sustain a defined operational level for a specified period of time.
 - Domestic ammunition production capability is being maintained (at least in theory) to provide sustainment capability beyond opstock holdings.
- However, risk management practices are not in place to ensure that each of these program elements remains capable of responding to CF needs and is cost-effective.
- For example, ammunition holding policies have not been re-examined in light of change in the risk landscape for ammunition planning and acquisition in recent years.
- In addition, responsibilities for safety stocks, opstocks, and industrial capacity are organizationally fragmented, preventing a strategic and integrated approach to managing risks across these program elements (e.g., risk trade-offs between opstock holding levels and industrial production capability).

¹³ The costs and risks of carrying surplus ammunition can be considerable and include storage and handling costs, risk of obsolescence, and disposal costs if the ammunition is not used. Disposal costs have risen substantially due to higher environmental standards.



Human Resources

Attracting and retaining needed technical and procurement skills is a challenge for the AAP.

- Human resources (HR) skills are needed to ensure that ammunition is safe, that it is acquired in a timely manner, and that due diligence for procurement activities is exercised.
- The AAP has experienced challenges attracting and retaining required HR skills.
- HR systems have yet to resolve broader issues that contribute to difficulties attracting personnel to ammunition careers.
- A shortage of procurement personnel is a systemic problem across the Public Service.
- Outsourcing decisions have been made without consideration of which strategic core competencies need to be retained in-house (e.g., erosion of smart buyer capability and configuration management).



REASONABLENESS OF AAP EXPENDITURES

There are instances where the DND/CF has procured more ammunition than needed to support identified training requirements. This has occurred as a result of disconnects in ammunition planning processes and, in past years, due to efforts to support MSP suppliers. While the practice of supporting MSP suppliers through the acquisition of ammunition quantities that are excess to requirements does not appear to have occurred to any material extent in recent years, there are indirect indicators that MSP expenditures may be too high in other respects.

Procurement Performance Indicators

Quantity and price are key indicators of ammunition procurement performance.

- The procurement objective of satisfying requirements at the least cost is achieved through **best price** and acquiring the **minimum quantity** needed to satisfy requirements while balancing an acceptable risk of stock-outs.

Reasonableness of Ammunition Quantities Procured

Efforts to meet production commitments to MSP suppliers during the 1990s resulted in instances where more ammunition was procured than needed; however, study data suggests that this practice has not occurred to any material extent in recent years.

- Holding policies for training ammunition are 6 to 18 months of anticipated consumption for domestically procured items and two to three years for items procured offshore.
- Past procurement staff in the DND/CF and PWGSC stated that efforts to meet production commitments with MSP suppliers during the 1990s caused the DND/CF to procure more ammunition than needed to meet identified requirements (e.g., 155MM Propelling Charges, CRV-7).
- A 1988 OAG study that examined procurement activity during the 1980s also concluded that the MSP resulted in procurement of ammunition that is not required.
- An assessment of program data since 1999 suggests that the practice of acquiring ammunition beyond holding policy levels in order to support MSP suppliers has not occurred to any material extent.

Weaknesses in the requirements determination process contribute to excess procurement.

- Procurement staff identified examples where force generators revised requirements downward after contracts were let, resulting in more ammunition than needed being procured (e.g., 105MM High Explosives Extended Range).



- Procurement staff also indicated that process disconnects associated with the removal of weapon systems from service resulted in training ammunition being procured beyond when procurement should have ceased or been reduced (e.g., M72 VSAW sniper ammunition).¹⁴
- Limitations in management information systems prevent visibility of ammunition assets held on ships, resulting in ammunition items being procured beyond holding policy levels (e.g., flares, signals, demolition charges).

There are indicators that ammunition requirements have been overstated, in turn, also contributing to excess procurement.

- The land force and air force were able to cut a combined total of \$55M from their ammunition funding for fiscal years 2002 to 2003 with no identified risk impact on readiness levels, suggesting that statements of requirements were overstated.
- The land force and air force identified in early 2006 that they could sustain a 10-percent cut to their ammunition allocation without adverse operational impacts in the short term.
- A comparison of requirements plans with usage data obtained from CFSS for the three-year period 1999 to 2001 shows that annual usage rates ranged from approximately 65 percent to 80 percent of stated requirements.¹⁵

*While records were not available to assess instances of stock outages, procurement staff was of the opinion that the track record for meeting training requirements has generally been good.*¹⁶

- Anecdotal statements by interviewees suggest that there have been some instances where ammunition holdings have fallen below that needed to sustain training requirements.
- Factors contributing to ammunition procurement shortfalls include:
 - Long and, at times, unpredictable FMS process;
 - Contractor delays (e.g., fire at production plant for aircraft flares);
 - Impediments in ammunition planning and acquisition process (e.g., delays in development of requirements plans, protracted contract negotiations, oversight by procurement staff).

¹⁴ Conversely, there have been instances where procurement staff were advised that weapons would be removed from service, causing procurement to be discontinued, only to later discover that the ammunition continued to be consumed (e.g., 60MM Mortar).

¹⁵ Usage information could not be extracted from CFSS beyond the year the system was upgraded in 2001/02. There are a variety of valid reasons why actual usage may fall below anticipated requirements (e.g., weather, unforeseen operations).

¹⁶ Refers to safety stocks for training ammunition—not opstock holding levels.



Reasonableness of Prices and Other Procurement Expenditures

Weaknesses in the MSP management framework are barriers to assessing the reasonableness of prices and procurement expenditures for ancillary ammunition services and industrial capacity.

- A tenet of procurement policy is that full and open competition is the best means for assuring best price and value for money—whereas most DND/CF recurring ammunition purchases are sole-sourced either from MSP suppliers or through FMS.
- In the absence of the price discipline achieved through a competitive bidding process, alternative control mechanisms are inadequate to ensure reasonable prices.
- For example, competitive price benchmarking, which is a litmus test for price reasonableness, is not being adequately utilized.
- Even if competitive benchmarking data was available, there are other barriers to assessing the reasonableness of MSP prices or if the DND/CF is procuring ammunition industrial capacity and services beyond its requirements.
 - DND/CF requirements have not been developed to justify the amount and type of ancillary ammunition services and industrial capacity being procured.
 - Contracts do not provide enough detail to understand the nature and extent of supplier deliverables and associated costs (e.g., multiple items such as services, industrial capability, and other payments to industry are bundled into supplier overhead costs or ammunition unit prices).
 - Price structures are complex (e.g., cost and profit sharing formulas can take years to settle before contracts are closed out and credits are reflected in ammunition prices).
 - Crown price accounting practices for MSP ammunition cause price distortions (e.g., changing pricing methodologies associated with supplier overhead costs, Crown holding ammunition prices artificially high in order to provide industry with additional funding for infrastructure improvements).
 - Payments have been made, other than for the acquisition of goods and services (e.g., ongoing \$3.5M for improvements), without justifying the expenditure of public funds.
 - Historical baseline cost information is not being maintained to understand MSP supplier cost structures (e.g., impact on supplier costs resulting from changes in DND/CF and non-DND/CF demand).

Notwithstanding barriers to assessing the reasonableness of amounts paid to MSP suppliers, indirect indicators suggest that amounts paid are too high.

- Fixed cost (FC)¹⁷ payments to MSP suppliers represent a growing and significant share of AAP expenditures and appear high relative to current levels of DND/CF ammunition demand.¹⁸

¹⁷ Fixed costs include overhead, general administration, and other costs, which do not vary with changes in the quantity of ammunition that is procured.

¹⁸ FMAS data shows that from FY 1995 to 2005 inclusive, additional expenditures totalling approximately \$390M were made to MSP suppliers, beyond that identified by procurement staff under the AAP.



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Supplier profit trends also suggest that MSP prices may be too high.

- A 2004 analysis conducted by the RAND Corporation¹⁹ shows that for the years 1997 to 2002, the primary MSP supplier's defence business has outperformed its other lines of business. Table 1 shows that in each of these years, the company's defence business accounted for a greater percentage share of its operating income than its revenues. This is the case even though the Crown has historically borne much of the business risk for the ammunition business.

	1997	1998	1999	2000	2001	2002
Defence revenues (M\$)	194.5	175.4	171.5	208.0	211.4	277.4
Defence operating income (M\$)	13.9	11.1	12.9	12.1	12.4	16.3
Percentage of total revenues	14%	12%	13%	12%	9%	8%
Percentage of operating income	20%	15%	17%	14%	11%	11%

Source: SNC-Lavalin Group Inc., Annual Reports 1998-2002

Note: In addition to ammunition, defence revenues include the revenues of Securix, which makes fire protection systems.

Table 1. MSP Supplier Corporate vs. Ammunition Business Line Profitability. *The primary supplier's earnings for ammunition from 1992 to 2002 are higher than its other lines of business.*

Procurement staffs in PWGSC and the DND/CF are of the view that MSP payments are too high since amounts paid by the DND/CF exceed amounts prescribed by the Department of Supply and Services (DSS) Procurement Policy DSS 1031-2; however, this test may not be sufficient to assess price reasonableness in the case of the MSP.

- Procurement Policy DSS 1031-2 pertains to the treatment of supplier overhead costs in Crown procurement contracts and states that the Crown should pay a "proportional share" of supplier overhead costs.
- PWGSC is of the view that the amount paid by DND/CF exceeds amounts it would pay if all supplier customers paid their share of supplier overhead costs (i.e., non-DND customers do not bear a fair share of supplier overhead costs).
- While DSS-1032-2 provides one mechanism for assessing reasonableness of prices, it alone may not be a sufficient test in the case of the MSP due to the unique nature of the supply arrangement.
- For example, DSS 1031-2 may overstate the premium paid by DND/CF if ancillary services required by the DND/CF are bundled into supplier overheads or if industry is maintaining capacity that is excess to levels it would otherwise maintain to support current production levels in order to meet DND/CF strategic requirements for standby industrial capacity.

¹⁹ *Lessons from the North: Canada's Privatization of Military Ammunition Production*, RAND Corporation, National Defence Research Institute, 2004.



- Alternatively, DSS 1031-2 may understate the premium paid by the DND/CF if the amount of industrial capacity paid for by DND/CF is surplus to its current requirements (e.g., if the export market was not there, what is the minimum industrial capacity required to support DND/CF requirements).
- Improved understanding of DND/CF requirements and objectives, as well as improved visibility of supplier deliverables and costs, is needed to assess MSP price reasonableness.

Offshore ammunition may not always have been acquired through the most cost-effective source of supply.

- Where ammunition must be procured through FMS, DND/CF has little if any influence over price, other than timing its procurement to align with production windows for other defence organizations.
- For some ammunition there is an option to acquire the ammunition through FMS or through direct commercial buys.
- Procurement staff observed that the most cost-effective alternative for acquiring offshore ammunition may not have always been pursued where there was an option to procure through FMS or direct commercial buys.



RECOMMENDATIONS

1. Governance & Organization

- Clarify responsibilities, authorities, and accountabilities for ammunition planning and acquisition, including the mandate of boards and committees required to govern the program.
- Establish a management framework that provides for a more strategic, integrated, and risk-based approach to ammunition planning and acquisition.

2. Program Scope

- Consider all dimensions of ammunition requirements (e.g., opstocks, ancillary services, industrial capacity and readiness) in ammunition planning and acquisition activities, not only the type and quantities of ammunition required for training.

3. Business Processes

- Establish a logical and visible process for ammunition planning and acquisition, including the identification of interdependencies among activities and communication and handoff procedures.
- Design business processes with a view to reducing the overall cycle time for ammunition planning and acquisition.
- Identify a process owner responsible for the effective and efficient functioning of the overall ammunition planning and acquisition system.

4. Information for Decision Making

- Develop management information systems to ensure that accurate, timely, and complete information is available to facilitate fact-based decision making for requirements determination and procurement.



ANNEX A—MANAGEMENT ACTION PLAN

Ser	CRS Recommendation	OPI	Management Action	Target Completion Date
1.	<p>Governance & Organization</p> <p>Develop a detailed responsibility matrix to clarify responsibilities, authorities, and accountabilities for ammunition planning and acquisition, including the mandate of boards and committees required to govern the program.</p> <p>Establish a management framework that provides for a more strategic, integrated and risk-based approach to ammunition planning and acquisition.</p>	To be determined by Ammunition Board	<p>The first meeting of an “Ammunition Board,” co-chaired by COS ADM(Mat) and C Prog, will be held on 9 Mar 07. This Board will be responsible for the procurement and management of ammunition, including annual training requirements, in-service ammunition stocks consumed in transition, and operations stock requirements.</p> <p>The Ammunition Board (supported by a Working Group comprised of representatives from ADM(Mat), VCDS, ECS and Operational Commands) will develop a detailed responsibility matrix that will clarify the responsibilities, authorities and accountabilities for ammunition planning and acquisition.</p> <p>The Ammunition Board will develop a risk-based, strategic framework, in support of ammunition planning and acquisition.</p>	To be determined by Ammunition Board
2.	<p>Program Scope</p> <p>Consider all dimensions of ammunition requirements (e.g., opstocks, ancillary services, industrial capacity and readiness) in ammunition planning and acquisition activities, not only the type and quantities of ammunition required for training.</p>	To be determined by Ammunition Board	The Ammunition Board will broaden its acquisition program to address transition and operational stock requirements.	To be determined by Ammunition Board



ANNEX A

Ser	CRS Recommendation	OPI	Management Action	Target Completion Date
3.	<p>Business Processes</p> <p>Establish a logical and visible process for ammunition planning and acquisition, including the identification of interdependencies among activities and communication and hand-off procedures.</p> <p>Design business processes with a view to reducing the overall cycle time for ammunition planning and acquisition.</p> <p>Identify a process owner who is responsible for the effective and efficient functioning of the overall ammunition planning and acquisition system.</p>	To be determined by Ammunition Board	<p>The Ammunition Board will develop an ammunition and planning acquisition process model and an associated responsibilities matrix. The model will start with requirements planning, follow through until consumption of ammunition or disposal at the end of service life, and will include decision points and hand-offs between different offices. The responsibility matrix will identify appropriate review and approval levels for each decision. (VCDS, ECS, and Operational Command participation will be essential, particularly with respect to defining operational requirements.)</p> <p>An acquisition process model will have the flexibility to accommodate procurement via FMS, Case Commercial, and MSP source with optimized procurement patterns for source and ammunition complexity.</p> <p>The Ammunition Board will confirm the overall ammunition acquisition process owner and document the responsibilities of other OCIs.</p>	To be determined by Ammunition Board



ANNEX A

Ser	CRS Recommendation	OPI	Management Action	Target Completion Date
4.	<p>Information for Decision Making</p> <p>Develop management information systems to ensure that accurate, timely, and complete information is available to facilitate fact-based decision making for requirements determination and procurement.</p>	To be determined by Ammunition Board	<p>The Ammunition Board will develop an ammunition information management system that will provide enhanced tools required for fact-based, decision making for requirements determination and procurement decisions. The system will be based upon the existing Ammunition Inventory Management System (AIMS). In order to maximize e-transfer of data and minimize current problems with multiple, independent sub-optimal systems and environmental security concerns, we will recommend the system be developed under ADM(IM) auspices and be able to communicate with existing departmental information technology systems used in the day-to-day management and acquisition of ammunition.</p>	To be determined by Ammunition Board



ANNEX B—AMMUNITION ACQUISITION PROGRAM LOGIC MODEL

