Interdepartmental Review of the Canadian Patrol Frigate Project

Report on the Contract Management Framework

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DND/PWGSC

Table of Contents

Interdepartmental Review of the Canadian Patrol Frigate Project: Contract Management Framework

1.1 Introduction

1.1.1 This report presents the results of an independent review of the contract management framework for the Canadian Patrol Frigate (CPF) Project. It forms part of an Interdepartmental Review performed by review, human resource management and security staffs from the Department of National Defence (DND), from Public Works and Government Services Canada (PWGSC), as well as teams from Coopers and Lybrand (C&L) and D&A Carmichael. The Interdepartmental Review has addressed a spectrum of topics related to the management of the CPF Project, including contract management, conflict of interest (COI) and security. With the exception of the human resource management (HRM) issues, separate reports are being issued under the direction of a Review Steering Committee consisting of the DND Chief Review Services and the PWGSC Director General Audit and Review. HRM matters were investigated and reported under the direction of appropriate authorities in accordance with applicable departmental policies. In order to assess the overall effectiveness of the Project's contract management, Part 1 of this report, prepared by DND Review Services, addresses several systemic issues. Part 2, prepared by DND and PWGSC review staffs, provides an assessment of specific concerns raised by sources external to the two departments.

1.1.2 This report is intended to provide an assessment of aspects of project management as performed by the Crown. It is not intended, nor designed, to provide any definitive judgements or conclusions with respect to the performance of contractors. Any comments concerning the contractor(s) is incidental to the primary focus of the review work and should be understood as such by the reader.

1.2 The Review Background

1.2.1 In Summer l994, DND's Director of Special Examinations and Inquiries (DSEI) began an examination into allegations of conflict of interest (COI) within the CPF Project Management Office (PMO). The original request for this examination was from the Project Manager and the allegations were raised by a subcontractor associated with a $90M project for the development of the CPF Combat Systems Trainers (CST). However, over the course of the next several months, the Crown received numerous additional allegations/concerns from different sources. These pertained to HRM, conflict of interest, payments made without receipt of satisfactory deliverables, other contract management weaknesses, as well as deficiencies in national and industrial security. As the different allegations, concerns and complaints were

received, different review agencies and mandates became involved. In total, the Review has examined in excess of 160 individual allegations and specific concerns, the bulk of which were raised by individuals formerly having some involvement with the CPF Project.

1.2.2 While this examination was in progress, certain issues regarding the CST were reported in November l994 media coverage. Further coverage occurred in February l995 when CTV's W5 Program aired a segment that was largely critical of the management of the CPF Project and the performance of the Frigates. In April l995, the Acting Deputy Minister DND, with the concurrence of the DM PWGSC, directed that the scope of the independent review be expanded from the CST to include value-for-money and probity considerations for the whole CPF Project. Principally, this was intended to require that, in addition to review work in progress, the contract management framework for the CPF Project was to be audited. Subsequently, in June l995, the departments received two letters conveying a lengthy list of concerns raised by a former employee of the prime contractor; these too have been addressed.

1.2.3 The overall management and coordination of the Review occurred at two levels. An Interdepartmental CPF Review Steering Committee, consisting of DND/Chief Review Services (CRS) and PWGSC/Director General Audit and Review (DGAR), oversaw the Review. At the working level, an interdepartmental working group of representatives met on a regular basis to exchange information and to coordinate review activities.

1.2.4 The magnitude and complexity of the Review cannot be overstated. It has encompassed diverse issues, many of which were interdepartmental in scope, as well as project activities that have taken place over the course of many years. The major topics and the agencies involved in the Review are as depicted in Table 1.

1.2.5 In many respects, the scope and magnitude of the CPF Project were unprecedented. We are aware from past audits of Major Crown Projects that, at the time, there was relatively little prescriptive guidance for project management. Accordingly, we have endeavoured to take this into consideration in formulating our comments. At the same time, we have been guided by: our appreciation of weaknesses/risk areas affecting many past capital acquisition projects; the "concerns" raised by external parties; and, the requirements of Treasury Board Policy and the Financial Administration Act and its attendant regulations. Among the basic questions are: Did the Crown get what it contracted for? Did the Crown only pay for what it got? Do the products perform? Have the requirements of the FAA been complied with? Does the Crown know what the Project cost? Were there aspects of the management of the Project which detracted from value for money? And, has the Project remained within the approved budget?

Table 1: CPF Review Roles and Responsibilities

Area of Review	Review Organization
CPF Contract Management	DND/Chief Review Services (CRS) and PWGSC/Director General Audit and Review (DGAR)
Contract Management for the Combat Systems Trainer (CST) Acquisition	Price Waterhouse Coopers (then Coopers & Lybrand) under a contract managed jointly by DND/CRS and PWGSC/DGAR
Conflict of Interest	DND/CRS and PWGSC/DGAR
Security of Information	DND Security and Military Police and PWGSC Internal Affairs/Industrial/Corporate Security
Human Resources	DND Directorate of Civilian Personnel (Materiel) and PWGSC Staff Relations, Compensation and Systems Directorate

The Review Reports

1.2.6 The results of the CPF Review are contained in several reports in order to segregate the review work that was not an interdepartmental effort and to report aspects of the Review in the most timely manner possible. Although the Review has been promulgated in separate reports, a co-ordination working group with representatives from PWGSC and DND reviewed all the concerns/allegations, review methodologies, and conclusions to identify any cross linkages between each review component. The CPF Review is comprised of the following reports:

a. *Interdepartmental Review of the CPF Contract Management Framework*. This report details the assessment of systemic contract management issues and responds to 44 specific concerns related to the CPF prime contract and associated contracts for spare parts. Part 1 of this report, *Systemic Issues Related to CPF Project/Contract Management*, presents the results of a DND review of systemic contract management issues. To a significant extent, Part 1 of this report, *System Issues*, provides background and context for Part 2, *Assessment of Specific Concerns*. The specific concerns were raised by sources external to the two departments. The assessment at Part 1 was performed by DND Review Services staff, Part 2 presents the results of work by both DND and PWGSC review staffs.

b. *CPF Cost and Capability Comparison*. DND Review Staff performed an independent comparison of cost and capability information for the CPF relative to frigates built by several other nations during the same timeframe and which are currently serving in the North Atlantic and Pacific Rim.

c. *Coopers and Lybrand Review of the CST Contract Management*. To provide more timely review and an increased measure of independence, contracted auditing services were awarded to Coopers and Lybrand. Their report addresses specific concerns and allegations pertaining to contract management for the Combat System Trainer (CST) acquisition.

d. *Departmental Reviews of Conflict of Interest*. DND and PWGSC review staff address allegations related to the propriety of activities of CPF PMO personnel, principally regarding the management of the CST project.

e. *Interdepartmental Review of CPF Security*. This report is a DND and PWGSC assessment of security concerns investigated by security personnel from both departments.

f. *Human Resources Management*. Allegations involving human resource management issues were raised against senior personnel in the CPF PMO. These have been investigated and reported by appropriate authorities in accordance with applicable departmental policies. The work was co-ordinated with, but not overseen by, other elements of the CPF Review. As
we understand, only one such allegation, involving the distribution of a memorandum in only one official language, has been founded.

1.2.7 Specific review results are presented in these individual reports. This current report presents the detailed results of the review of Contract Management for the CPF Project, exclusive of the CST acquisition.

2.1 The Review Results in Brief : CPF Contract Management

2.1.1 The Canadian Patrol Frigate (CPF) Project is the largest single defence procurement ever undertaken by Canada. The Project, as originally approved in l983, included the construction of six ships and the associated infrastructure, with a budget of $5.435 billion (B). This is referred to as Ship Replacement Program 1 (SRP 1). Subsequently, in l987, a second phase – SRP 2 – was approved for the acquisition of six additional frigates; the project budget was increased by $4.982B. The chart that follows provides an overview of the approved funding and 1996 forecasted costs for the Project.

Approved Funding For CPF Project	**$ Billion**
SRP 1 1983: Six frigates and infrastructure (Forecasted Budget Year $)	$5.435B
SRP 2 1987: Six additional frigates (Forecasted Budget Year $)	$4.982B
Total Approved Funding Level: 12 frigates and infrastructure (Forecasted Budget Year $)	$10.417B
Total Approved Funding Level (Actual Escalation Rates Budget Year $)	$9.537B
Project Management Office Forecasted Final Cost (Actual Escalation Rates Budget Year $)	$9.006B
Forecasted Final Cost Including "Associated" Expenditures	$9.310B

Table 2: Funding History of the CPF Project

All of the frigates are now in service and, at the time of the Review, it was anticipated that the Project would be completed within budget. The production of a world-class fighting ship is a significant accomplishment for both the Crown and Canadian Industry; however, it has not been without major challenges. In fact, the Project Management Office (PMO) made the observation that there was a requirement to "relearn the warship-building process in Canada".

2.1.2 Overall Amending Agreement. By l994, the Project had experienced significant setbacks, including contractual disputes, major difficulty in software integration for combat and marine systems, and the late delivery of ships. In July of that same year, an Overall Amending Agreement (OAA) was negotiated between the Crown and the prime contractor to address over 400 technical and contractual issues that had accumulated over the course of several years. Claims submitted by the contractor were in excess of $880 million (M).

2.1.3 The OAA, negotiated at a cost of $323M to the Crown, involved tradeoffs on a number of dimensions and set the stage for the Project to continue to progress. However, we noted that the strength of the Crown's negotiating position may have been reduced by the fact that almost 90% of the $6.2B prime contract had already been paid. (Late delivery charges of $5.4M for ships seven and eight formed part of the negotiations.) In addition, the Crown did not undertake a detailed breakdown of costs relative to its own claims as one frame of reference for negotiating this agreement. The contracting strategy (i.e. Total System Integration Responsibility), which made the contractor responsible for the design and integration of systems, limited the amount of detailed information held by the Crown. Accordingly, to expedite matters, the Crown chose to negotiate the dollar settlement based on an estimate of "at-completion costs" and profit for the

contractor, not on an item-by-item basis. Without the benefit of a detailed cost breakdown, it was ultimately not possible for us to objectively assess whether the $323M cost of the agreement was reasonable.

2.1.4 Associated Project Costs. We noted that total costs incurred by the Crown to deliver the Frigates were at least $250M higher than reported against the approved project budget. We observed that "associated" Federal Government costs of $165M were not included in, nor charged to, the Project budget. These costs were the result of a Federal/Provincial agreement to cover overruns incurred by one of the major subcontractors involved in the Project. In addition, $85M in PWGSC revenue dependency charges was not captured within the Project budget. At the time, it was not a requirement for these revenue dependency charges to be factored into the original project funding approved by the Treasury Board; this has since changed. Finally, we found that $54M in insurance rebates and interest earned on advance payments was credited to the Project and not to the Consolidated Revenue Fund. An earlier internal audit questioned whether this was consistent with the requirements of the Financial Administration Act (FAA). As is indicated in the last item in Table 1, the Project could have absorbed all of these costs within the approved budget.

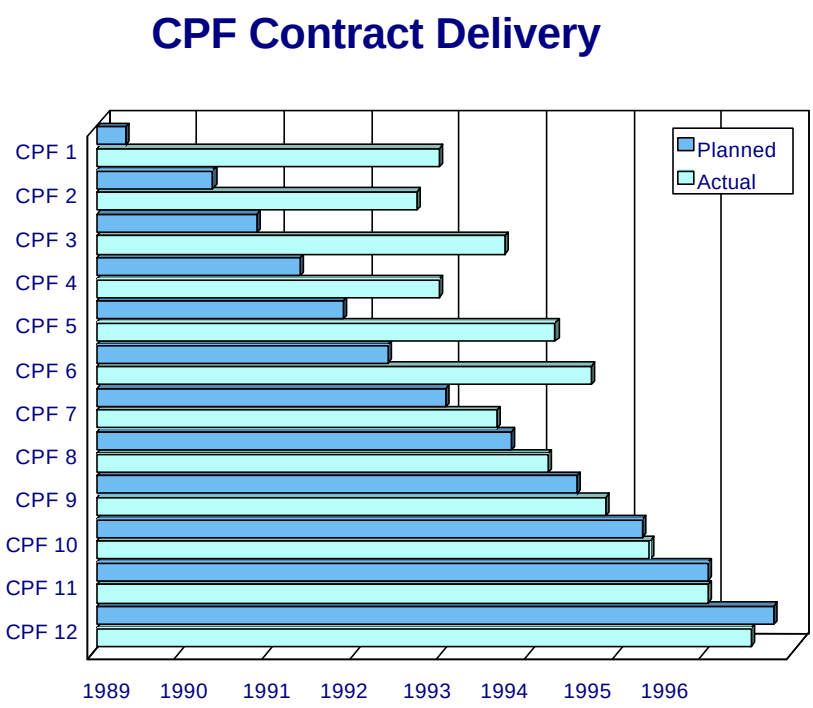
Systemic Assessment

2.1.5 Notwithstanding the difficulties encountered, we found that the Project received what was paid; for included a well-exectuted testing and evaluation regime for deliverables; has remained within budget; and, made payments in accordance with the contract and amendments. We have, however, recommended a number of improvements dealing chiefly with effective risk management, particularly as it anticipates and addresses changes over the full life cycle of equipment acquisitions.

2.1.6 We have also concluded that our assessment of CPF contract management would have been decidedly more critical had the Project ended with the acquisition of the first six frigates. Significant difficulties were experienced in the initial phase of the Project, SRP 1. As is evident in the discussion which follows, SRP 2 clearly profited from SRP1; the experience and lessons learned ultimately benefited all of the ships delivered. (It is the CPF PMO view that the project would have benefited further from the SRP 1 experiences had the 24 ship requirement come to fruition.) *Delays had to be overcome, independent expertise was brought to bear on software integration difficulties, the contracted Cost Schedule Control System was eventually implemented, the contract was converted to a fixed price, and costs of $56M were avoided by purchasing spare parts directly from the original equipment manufacturers. We noted that the production cost per ship declined from $480M for the first ship to $424M for the last ship delivered.*

2.1.7 Delivery Delays. The chart that appears on page 8 depicts the actual and contracted delivery dates fro each of the twelve frigates. As indicated, there were significant delivery delays experienced for the fist seven frigates. Although contracted to be delivered in l989, and provisionally accepted in June l991, the final delivery of the lead ship did not actually occur until late l992. At the time of the l994 OAA, a total of seven of the twelve ships had been delivered. As a result, the prime contractor was assessed damages of $16.4M for the late delivery of the first six ships. However, as is also indicated below, the last ship was delivered ahead of the original schedule. This can be attributed to productivity gains made by the prime contractor during the production of the last six frigates.

2.1.8 Software Development and Integration. One of the most challenging aspects of the CPF Project was the development of combat and marine systems integration software along with associated documentation. Major software development difficulties contributed to significant schedule delays which resulted in the Crown withholding profit payments to the contractor and issuing notices of material breach of contract. The high level of integration was ambitious and the challenges involved were underestimated. The PMO has also pointed out the contractor's concern that processes imposed by the Crown were dysfunctional. We noted that the Project eventually made effective use of independent expertise to assist in defining and situating the problems to be resolved; the resolution occurred in stages. However, we also noted that difficulties may have been overcome earlier if independent expertise had been sought prior to l989. This system integration is consistent with the requirement that the Frigate essentially be able to fight "by itself" in a fully automated mode.



NB Planned delivery dates reflect original contracted delivery dates. CPF 1 was provisionally accepted in Jun 91.

2.1.9 Progress and Advance Payments. In the early to intermediate stages of the contract, large amounts of money were committed to the CPF Project, which was experiencing schedule delays. Although damages were paid by the contractor and profit withheld, the delays affected the operational capability of the Canadian Forces. In addition, the payment structure was such that delays tended to transfer financial risk to the Crown. This resulted from the contractual provisions for extensive use of advance and progress payments, as well as the relatively limited use of payments linked to actual final deliverables. Prior to the OAA, the prime contract had an overall ceiling price, whereby contractor costs were reimbursed on the basis of bi-weekly progress claims with additional incentives in the form of performance bonuses. Given the significant start-up costs and the developmental aspects of the Project, the use of advance payments in the early stages of the Project was likely reasonable. However, the continued use of advances after the Crown had negotiated for the second set of six ships is questionable. It was not until the l994 OAA that the contract was converted to a fixed-price and the method of payments was changed from one based primarily on bi-weekly progress claims to one based on the delivery of products and milestones.

2.1.10 Cost Schedule Control System. The contract called for the implementation of a Cost Schedule Control System (CSCS) within the first year of the Project. However, the contractor experienced difficulty in validating the system's accuracy. As is apparent from the preceding discussion, the output of this system would have played an important role in the payment process. Due to the difficulties experienced, alternate means had to be used by the Crown to forecast final costs and delivery schedules. Adjustments to the CSCS continued following the OAA, the system was eventually certified in l993/94 well after the delivery of several ships.

2.1.11 Spares Procurement. Procurement of Initial Provisioning (IP) spare parts through the prime contractor for the first six frigates resulted in additional costs of $144M associated with tiers of contractor profit and administration fees. While recognizing the potential advantages, particularly in terms of managing risks associated with the potential for design changes and the consequent impacts on parts procurement, we did not find an analysis by the PMO justifying these costs. We also questioned the extent to which the contract terms provided incentives for procurement of spares at the best available price. With the assignment of additional staff to the function for SRP 2, the Crown negotiated contracts directly with original equipment manufacturers. We estimate that this strategy resulted in cost avoidance of $56M for SRP 2. Finally, without finding evidence of loss, we observed that, in some instances, DND could not initially demonstrate that it had received spares for which payment had been made. We also found that the procedures followed for the recording of SRP 1 shipboard spares inventory were not properly documented.

Specific Concerns Examined

2.1.12 Audit work at the systemic level assisted our examination of 44 specific concerns raised by parties external to the two departments (DND and PWGSC) and which pertain to CPF contract management. Of the 44 concerns examined: nine were found to have "some merit" but were resolved through actions by the PMO; two others had "merit", but lacked demonstrable consequence; and, 33 were found to be inaccurate, incomplete or no longer relevant.

2.1.13 Note that our methodology was such that reasonable interpretations had to be made of those allegations which were unclear as expressed by complainants. Ten of the 44 fell into this category. Of those nine concerns referred to above as having "some merit", five were resolved during the OAA negotiation between the Crown and the prime contractor prior to the commencement of the audit.

Other Issues

2.1.14 During our review, a concern was raised by a team from the Office of the Auditor General with respect to the CPF combat system software safety analysis. This issue is not addressed as part of this current review. (See para 2.1.21.) Another complaint refers to payment for a $46M deficient weapon. This will be pursued separately from the CPF Review; no evidence could be found to suggest this was relevant to the CPF Project.

2.1.15 The discussion that follows, indicates, under individual headings, the results of our systemic assessment of CPF contract management as well as our assessment of specific concerns raised by external parties. This is followed by detailed discussion of findings and recommendations which are presented under these same headings.

The Total System Integration Responsibility (TSIR) Contracting Strategy

2.1.16 A difficulty experienced by many past projects has been that the interaction between the Crown and the contractor is such that specific accountability for performance breaks down. The result can be delays, cost overruns and compromises in performance. As it happened, delays were experienced in the delivery of the first six Frigates and, consequently, in the forecasted availability of the intended capability for the Canadian Forces.

2.1.17 The intent of the CPF contracting strategy was to make the prime contractor responsible for delivering the total integrated product and to limit Crown input to the provision of advice. However, in the early stages of the Project, and particularly with respect to its more developmental objectives, it became apparent that the contracting strategy, as originally conceived, provided insufficient flexibility to ensure application of the combined expertise of the contractor(s) and the Crown. Accordingly, we have recommended that such contracting strategies be designed in the context of a comprehensive front-end risk assessment and plan which recognizes changing risks over the life of the project. (A detailed discussion concerning TSIR is presented commencing on page 19.)

Financial Management

2.1.18 We found that the prime contractor was paid in accordance with the negotiated terms of the $6.225B prime contract. We do, however, have reservations that the contract placed considerable emphasis on bi-weekly progress payments based on costs incurred and that there was lesser emphasis on milestone payments based on demonstrated deliverables. To the extent that costs incurred were not a good indicator of actual progress, it was not clear that compensation was consistently well linked to results. This concern was exacerbated by the fact that the principal system for the reporting of contractor costs and schedule was not validated until well into the Project. Another consideration is that, as delays occurred, they would tend to shift the financial risk in the direction of the Crown.

2.1.19 In l994, the $323M OAA was negotiated between the prime contractor and the Crown to address technical and contractual issues which had arisen over the course of several years. Particularly with respect to technical issues, it involved a thorough, constructive and realistic resolution of issues. We have, however, observed that the Crown did not prepare a breakdown of costs, relative to its own claims, as one frame of reference for negotiating this agreement. The negotiated OAA involved trade-offs on a number of dimensions and set the stage for the Project to progress. However, as there was no detailed costing available to the CPF PMO for technical issue resolution, it was not possible for us to objectively assess the reasonableness of this settlement.

2.1.20 We also found that the CPF PMO has set a high overall standard in terms of financial reporting and that the Project was forecast to remain within its approved budget. However, we could not reconcile with the requirements of the FAA the accounting treatment of $54M in insurance rebates and interest earned on advance payments. In addition, we recommended that departmental project reporting capture certain associated costs to the Crown, including $85M in charges for services from PWGSC and $165M in connection with a government agreement to assist a subcontractor having involvement in the CPF. (A detailed discussion concerning financial management is presented commencing at page 23.)

Quality Assurance/Testing and Evaluation (QA/T&E)

2.1.21 We found the QA/T&E regime for the CPF to be well conceived and executed. It was appropriately focused on high risk areas and it demonstrated high stakeholder involvement. The CPF is cited as a positive example in the CRS Report on the Management of Equipment Testing and Evaluation in DND. In short, the QA/T&E for the CPF was well managed. Notwithstanding, we also note the concern raised by the Office of the Auditor General that the testing regime did not include a scenario whereby all systems were activated simultaneously. A further concern focused on the extent of safety analysis for the weapons systems integration. However, the CPF PMO has questioned the practicality of the additional testing implied by these comments. (See report page 48, para 14.1.10 and Annex A, Serial 8 for further detail. (A detailed discussion concerning QA/T&E is presented commencing at page 32.)

System Integration Software Development and Documentation

2.1.22 Significant delays were experienced in the development of integration software. The high level of integration was ambitious and the challenges involved may have been underestimated. The PMO has also pointed out the contractor concern that processes imposed by the Crown were dysfunctional. However, we noted that the Project ultimately made effective use of independent expertise to assist in defining and situating problems to be resolved. These difficulties may have been resolved earlier if independent expertise had been sought prior to 1989. (A detailed discussion concerning software development is presented commencing at page 34.)

Initial Provisioning (IP)

2.1.23 While we recognize the risk-management advantages resulting from procurement of IP spares through the prime contractor for the first six Frigates, we did not find an analysis assessing the additional costs associated with tiers of contractor profit and administration fees. We determined that these additional costs were $144M. Similarly, we questioned the extent to which the contract terms provided incentives for procurement of spares at best available price. We have also estimated that the changed strategy for the SRP2, whereby spares were purchased directly from the original equipment manufacturers, would result in cost avoidance of as much as $56M.

2.1.24 Finally, without finding evidence of loss, we have recommended improvements in the processes for receipt, payment and physical control of spare parts. Improved co-ordination between the payment, contracting and inspection authorities would have reduced risk in the payment and receipt process. (A detailed discussion concerning initial provisionings is presented commencing at page 36)

Warranty

2.1.25 We found that the Crown was protected by appropriate contracted warranty provisions. There are limitations placed on the liability of the contractor, but this reflects a balance of risk between the two parties. This balance must be considered in the context of TSIR, the complexity of the deliverables and the fact that a warship of this kind had not been built before in Canada. The limitations are consistent with PWGSC practice for firm-price shipbuilding contracts; a percentage is held back until the warranty has expired. In l994, a revised warranty cap, currently in place, was negotiated based on a forecast of potential claims. The warranty cap was subsequently amended to $21M and had not been reached at the time of audit. (A detailed discussion concerning warranty is presented commencing at page 44.)

Specific Concerns

2.1.26 Our audit work at the systemic level assisted us in addressing 44 specific concerns related to CPF contract management – other than for the CST – which were raised by parties external to the departments (DND and PWGSC). Among the most serious and sweeping were that: a) the Crown paid $600M for systems integration for which no deliverables were received; b) contract price creep has added $3B to the cost of the Project; c) warranty provisions are ineffective; and d) there are weaknesses in the process for contract changes.

2.1.27 We found that, in many instances, information provided by the complainant(s) was not accurate, complete or current, and did not reflect the eventual outcomes achieved by the Project and negotiated settlements. For example, the cost of combat and marine systems integration was $148M, not $600M. It is true that there were delays in deliverables and we have commented at the macro-level on concerns regarding the alignment of payments and progress. Without attributing blame, we have also noted that difficulties did occur in the development of integration software. Additionally, the prime contract provided for payment for work performed without a requirement that deliverables be finalized. However, to the extent that technical performance and schedule were not met, milestone profit payments were withheld or delayed. Ships' crews and the fleet school have attested to the performance of the integration of combat and marine systems.

2.1.28 Concerns regarding price creep would appear to be based on confusion between the value of the prime contract and the amount of the total Project budget, accounting for a difference of about $3B. PWGSC review staff also found that concerns related to warranty did not have merit. Similarly, based on our examination of contract changes, we found no evidence to suggest that changes were unjustified or that those involving a reduction in work were approved without a corresponding adjustment in price.

3.1 The Program Background

CPF Project Initiation

3.1.1 The CPF Project was the culmination of a process initiated in the late 1960s intended to replace the ageing steam-driven St. Laurent class of destroyers. Major planning steps to achieve this goal began in November 1977 when a Statement of Requirements (SOR) was submitted outlining a proposal to acquire 24 ships. Based on this SOR, a Request for Proposal (RFP), which took into consideration existing threats and anticipated usage of the Frigates, was released to industry in 1978. Five contenders responded to the RFP, providing their preliminary designs in a funded competitive definition phase.

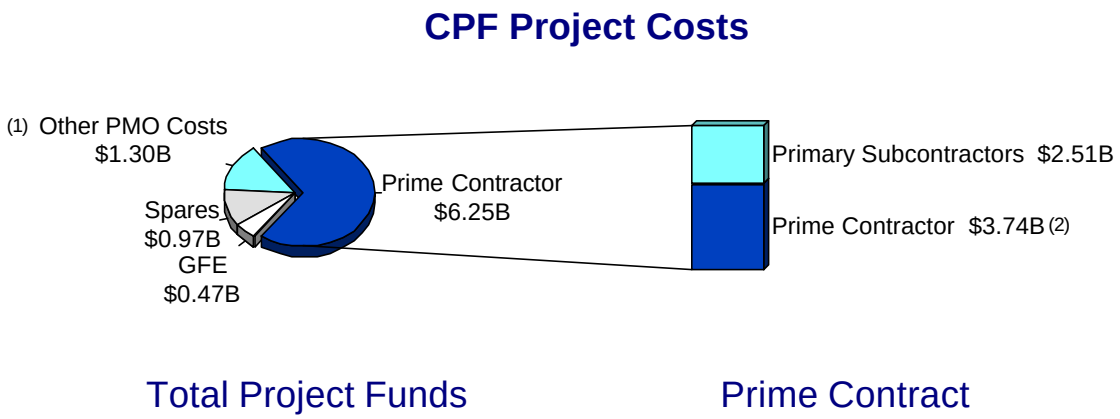
3.1.2 Of the five proposals submitted in 1978, two contenders were eliminated in 1980. Furthermore, the government announced that it would favour those contenders who maximized Canadian content. (Industrial benefits, which we have not audited, comprised a significant element of the Project objectives.) Two of the three remaining contenders were provided with additional funding to prepare more detailed proposals. In July 1983, the contract to build six new frigates was awarded. A major subcontract was awarded to undertake the design and integration of the ship's combat and marine systems. In addition, another firm was subcontracted to build three of the first six ships. The CPF contract was subsequently amended in 1987 to include the construction of an additional six frigates — all built by the prime contractor — for a total of 12 frigates.

CPF Project Magnitude

3.1.3 The CPF acquisition is the largest capital project ever undertaken by DND. The total budget of the Project approved by Treasury Board (TB) was $10.417B (forecasted BY$), with a funding time line from 1983 to 1998. The budget was subsequently adjusted by the CPF PMO to approximately $9.537B to accommodate actual escalation rates. The Project involved two phases: the first, approved by TB in 1983, authorized the construction of six ships to replace the St. Laurent class of destroyer — for a project cost of $5.435B — with the last ship to be delivered in 1992; the second, approved in December 1987, authorized the construction of six more ships and additional funding of $4.982B. The last ship was contracted to be delivered in 1996. Anticipated expenditures as at November 1995 are illustrated in Figure 2.

CPF Project Responsibilities

3.1.4 In order to allocate accountability and responsibility for the management of the CPF contract, an interdepartmental Memorandum of Understanding (MOU) was prepared in 1983 with the agreement of the three departments involved in the contract, namely DND, PWGSC and Industry Canada. DND, as the lead or client department, was responsible for securing the Project end results and for the overall management of the Project. PWGSC, as the contracting authority, was responsible for providing contracting advice and assistance while ensuring that all CPF procurement activities were carried out in accordance with established governmental regulations and policies. Industry Canada was responsible for ensuring that the industrial benefits expected from the program were realized. Integration and co-ordination of the departmental inputs were accomplished by the establishment of a Senior Review Board (SRB), which served to provide direction and guidance throughout the life of the Project.



November 1995 total project estimated costs at completion $9.006B (actual BY$).
(1)Other PMO costs include personnel, ammo, training, insurance and facilities.
(2)The prime contractor also subcontracted design work for $0.06B.

Figure 2

3.1.5 Responsibility for the delivery of the 12 ships was borne by the prime contractor who constructed nine of the ship platforms. Construction of three platforms was subcontracted in SRP1 to ensure equitable distribution of regional benefits. Another firm was the primary subcontractor responsible for systems integration and combat systems for all 12 ships.

CPF Project Objectives

3.1.6 As with most major capital projects, there were a number of objectives to be satisfied by the CPF Project. The Navy's primary objective was to replace an ageing steam-driven destroyer fleet, which was quite dated in its anti-air, anti-submarine and surface ship-warfare capabilities. Recognizing the need for replacement, and accepting the reality that departmental budgets would accept only one type of ship — rather than several types with specialized capabilities — the Navy sought to acquire a ship with multi-functional capabilities that would allow it to fulfil its maritime tasks based on the assessed needs in the late 1970s — when the SOR was being prepared.

3.1.7 The Crown, while concerned with the acquisition of an effective ship, also wanted to achieve flow-through benefits by concentrating as much of the development and construction of the ships in Canada as possible, in order to aid in industrial and regional economic expansion. It was also government policy to establish a Canadian capability for naval warship design and construction, as well as for the integration of large-scale and complex electronic command and control/combat systems. Consequently, the bidding process was altered in 1980 to favour those bidders who would encourage the creation and expansion of Canadian-owned businesses throughout the life of the contract.

CPF Project Risk Profile

3.1.8 One of the fundamental design differences in the CPF, which distinguished it from other ships being built in the same era, was the extent of combat and marine systems integration. Essentially, the design called for a ship that could — if necessity demanded — "fight by itself" with minimal operator input. While the majority of the combat sensors and weapons that were placed aboard the CPF were already in use by other NATO countries, no other frigate had integrated those components to the extent that was called for in the CPF SOR. The development of the software necessary to perform these integrated functions proved to be a major undertaking and represented one of the major risks for the Project. In essence, this was a high-risk, technologically complex developmental project. To understand more fully the complexity of this undertaking, readers are referred to the experiences of the British Navy in building the F23 class of ships, as documented in *Naval Forces*, June 1991, by Mr. Stuart Slade, an electronic systems analyst with *Forecast International*.

3.1.9 Designing and building a modern warship is a major challenge for any nation. The risk of undertaking such a complex project was increased by the Crown's objective of maximizing the use of Canadian companies. The Crown, recognizing the risk of developing a new class of ship, sought to minimize that risk by garnering as much information as possible about the consortiums that were interested in constructing the Frigates, as well as information on their strategies for meeting the performance requirement. This was accomplished, in part, through a procurement strategy that relied on source qualification and preliminary design proposals. The two final contenders were contracted to complete a funded contract definition and implementation plan. Following a bid evaluation, the prime contract was awarded for the first six CPFs.

3.1.10 The Crown was also anxious to mitigate risks affecting capital procurement projects — namely lengthy schedule delays, cost overruns and sub-optimal performance. Contractors, on the other hand, were concerned with Crown interference and constantly evolving design requirements. Therefore, both parties wanted a contract management environment to be established where the contractor would be more accountable for cost, schedule and performance without Crown interference. To promote accountability for results, the CPF project adopted a contracting strategy that became known as Total System Integration Responsibility (TSIR).

Part 1 – Systemic Issues: CPF Project/Contract Management

4.1 Introduction

4.1.1 This part of the report presents an assessment of a number of key aspects of the project and contract management practices identified during the planning phase of the Review. As indicated previously, key topics pertinent to the overall CPF contract management framework were identified and presented to the CPF Review Interdepartmental Steering Committee. They are: the Total System Integration Responsibility (TSIR) contracting strategy; project Financial Management; Quality Assurance/Testing and Evaluation (QA/T&E); the development of, and documentation for, System Integration Software; and, the acquisition of Initial Provisioning of spare parts.

5.1 Methodology

5.1.1 The objectives of the CPF Contract Management Framework review were twofold: a) to develop an understanding of the strengths and weaknesses of the overall contract management framework, thereby assisting the assessment of specific concerns identified by external parties; and b) to identify recommendations and lessons learned for the benefit of the CPF and subsequent MCPs.

5.1.2 The planning phase for this review work included a preliminary analysis of CPF procurement and contracting practices, including a preliminary round of interviews with senior PMO staff, an initial review of project documentation and a visit to the site of the prime contractor. This resulted in the identification of issues related to: risk management; validation of the achievement of defined performance requirements; the management of software development; financial reporting; payments for deliverables; and the procurement of initial provisioning spares. Lines of inquiry identified through the planning survey included:

- whether the TSIR contracting strategy was effective in moderating risk, promoting accountability and assuring progress;
- whether contracted deliverables were validated as to quality and performance relative to defined operational requirements;
- whether appropriate strategies were undertaken to address delays in the delivery of systems integration software and documentation;
- whether financial reporting was accurate and complete;

- ❖ whether contract payments were consistent with sound risk management and were appropriately based on, and promoted, accomplishment; and

- ❖ whether initial-provisioning spare parts were economically procured consistent with valid requirements.

Steps included in the more in-depth assessment of the above issues are:

- ❖ interviews with project and contractor staff;

- ❖ detailed examination of documentation;

- ❖ statistical sampling of transactions;

- ❖ utilization of computer assisted audit techniques;

- ❖ site visits; and

- ❖ consultation with specialist experts.

5.1.3 Prior internal audits of major capital acquisitions have commented on limitations regarding project management guidance. Accordingly, to a substantial extent, our audit was guided by efforts to assess the consequences of such weaknesses as they may have affected the CPF acquisition. We were also guided by the intention to ensure that we assessed processes and issues pertinent to the specific concerns raised by external sources and which are addressed in Part 2 of this report. Finally, we have considered the requirements of the Financial Administration Act (FAA) and attendant regulations, particularly as they pertain to contract payments and financial reporting.

6.1 Total System Integration Responsibility

Background

6.1.1 Lessons learned from past equipment acquisitions that have experienced cost and/or schedule overruns have emphasized the importance of a clear delineation of ultimate responsibility and accountability for meeting specified performance criteria for the project. It has not been unusual, and often understandable, for a contractor to decline to accept such responsibility. In response to Crown-initiated design changes and other such modifications, the contractor may have had insufficient control over events to ensure that the performance criteria, originally specified in the RFP and incorporated in the contract, could be satisfied.

6.1.2 In the case of the CPF Project, management sought to overcome these risks by assigning clear responsibility to the contractor for the delivery of the capability, cost and schedule. A contracting strategy was adopted that also made the prime contractor responsible for the detailed design and implementation of the CPF in order for the Crown to minimize technical risk. This became known as Total System Integration Responsibility (TSIR). Although referred to frequently by CPF project management staff as Total System Responsibility (TSR), both the contract and TB submission refer to TSIR. The TB submission includes the statement:

> The contract commits the Contractor to do everything necessary to achieve Total System Integration (TSI) of the ship systems. Responsibility for TSI includes, but is not limited to, ensuring that the training courses and training devices are adequate to fully train qualified personnel, the shore facilities and test equipments are compatible with the balance of the Project, the documentation and publications are sufficient to perform operation and maintenance of the equipments which they depict and the spare parts are compatible with the equipments or components for which they were designed...

Article B3 of the contract states in part:

> The Contractor agrees that the work includes the provision of all the effort, material, services, matters and things necessary to achieve Total System Integration, and that such work will be done for the contract price and without by itself entitling the Contractor to any increase in the ceiling price and within the Contract Delivery Dates. No change in the Cost to the Contractor from the Budgeted Cost of Work Scheduled as provided in Annex 1 of Schedule A of performing the work that is required to complete the design for the CPF Project to meet the performance requirements of the Specification shall result in any adjustment in the Target Cost, Target Profit or Ceiling Price. Total System Integration includes the task of aggregating, inter-connecting, checking out and making compatible the deliverable end items.

Article B3.3 further defines the performance standards by stating:

> The CPF systems shall meet or exceed the performance requirements set out in the CPF System Specification and the Software Specification...

6.1.3 In order to reduce the potential for the contractor to claim interference on the part of the Crown, a concept called "negative guidance" was introduced. Although the term was not defined in the contract, the Program Implementation Plan – a CPF PMO internal document – defined it as follows:

> ... [advising] the contractors when, in its opinion, the program requirements will not, or may not, be achieved. No solutions will be presented and the contractors may accept or reject such advice as they see fit. Furthermore, it was deemed critical to the success of the program that the CPF Program office restrain from positive direction of the work of the contractors.

It is important to note that the Crown did have the opportunity to participate and provide input through mechanisms such as design reviews.

6.1.4 The contracting strategy played a significant role in the overall management of the Project. These concepts became the foundation upon which all other project management processes and decisions were based. In migrating to this new approach, the CPF PMO was challenged to shift from a traditional emphasis on procurement direction to more of a procurement monitoring function. This was not always easy for either the Crown or the contractor to do, and some of the challenges encountered in this Project can be attributed to the process by which both parties worked out their obligations and responsibilities.

6.1.5 Since TSIR is essentially an approach to risk management, we tried to answer the broad question, "Does TSIR reduce risk?". With the CPF being a totally new ship, there were greater technical risks associated with its development than would have been the case with the production of an existing or modified ship design. "First in class" involved additional uncertainties, such as the certification of designs, establishment of the proof of producibility, and development and proof of test procedures, as well as the normal resolution of inherent integration and construction problems. These risks were largely unavoidable, regardless of the project management philosophy. Additionally, the risks affecting this project could be viewed as greater because of the objective of achieving Canadian warship design and construction. This was further complicated by the challenges of delivering highly integrated combat and marine systems.

Findings

6.1.6 In the early stages of the Project, it became apparent that, particularly with respect to the developmental objectives/attributes of the acquisition, the contracting strategy provided insufficient flexibility for application of the combined expertise of the contractor and the Crown. A practical approach was eventually worked out, but only after significant schedule delays had occurred. We were also concerned that the payment approach was such that, in addition to the operational implications for the Canadian Forces, delays tended to shift financial risk in the direction of the Crown.

6.1.7 With regard to the CPF prime contract, TSIR proved useful in establishing an environment conducive to holding the prime contractor accountable for delivering the contracted capability. The Crown's consistency in pursuing compliance with the contract assisted in reinforcing this. There were instances when the prime contractor was deemed by the Crown to be not compliant with the contract; however, when this occurred, liquidated damages were levied, profit was withheld, payments ceased or a negotiated settlement took place. In general, we observed that the goal of reduced interference on the part of the Crown was accomplished with the introduction of TSIR. In addition, changes/modifications to project scope and requirements were minimized, as evidenced by the relatively limited use of Contract Change Proposals (CCPs) having costs.

6.1.8 While TSIR was successful in reducing risk in some areas (e.g. risk relating to system integration), we found that it may have increased risk in other areas of the Project. Avoidance of possible claims of interference influenced the extent of intervention on the part of the Crown, even when it was apparent that assistance from the Crown may well have helped in the resolution of difficulties. For example, a major subcontractor experienced significant difficulty with the

integration of the combat system software. However, in the early stages of the Project, the Crown was hesitant to intervene or to provide anything other than "negative guidance" to the prime contractor. The Crown and the prime contractor eventually developed an approach for sharing experience and resolving technical problems, but not until major schedule delays to the whole project had occurred.

6.1.9 To maximize the benefits from TSIR requires that all elements of the contracting framework be consistent with the TSIR philosophy. On the CPF Project, although the contractor was ultimately responsible to deliver, a significant portion of the financial risk was carried by the Crown. In the early to intermediate stages of the contract, large amounts of money were committed to a project that was experiencing schedule delays – operational implementation of the first ships was delayed by over two years. Although liquidated damages of approximately $16M were paid by the contractor and profit was withheld, the delay occurred as well as the resulting impact on the operational capability of the Canadian Forces. In addition, the payment structure was such that delays tended to transfer financial risk to the Crown. This followed from the extensive use of advance and progress payments, as well as the limited use of payments linked to actual/final deliverables.

6.1.10 This project represents a major accomplishment as it was completed within the approved funding and overall schedule. We believe that part of this success can be attributed to TSIR. However, we would be reluctant to issue a blanket endorsement of the use of this concept. It should be recognized that TSIR, as it came to be practiced by the CPF Project, was not a "turnkey" operation on the part of the prime contractor. TSIR, as practiced in the later stages of the CPF Project, had a higher degree of Crown involvement, with the Crown acting in more than simply a monitoring role. This was deemed necessary to assure that the Project achieved its objectives.

Recommendations and Lessons Learned

6.1.11 TSIR can provide an effective approach to risk management. It is our recommendation that contracting strategies - including performance reporting, progress reviews, payment structures, QA/T&E and other aspects - be designed in the context of a comprehensive front-end risk assessment and plan. This plan should recognize the risks unique to each phase of a project. Indications are that TSIR, as originally designed for the CPF Project, proved to be less appropriate to the elements of the Project which were substantially developmental. Contracting strategies should be designed in recognition of changing risks over the lifecycle of an acquisition project.

6.1.12 There can be a cost associated with using TSIR. As the contractor is expected to deliver contracted capability, it will incur greater risk than would be the case if the Crown were responsible for the deliverable. As failed approaches and reworks are inevitable and should be anticipated – particularly in the developmental stages of projects – the increased risk is likely to be compensated for by an increase in the contracted price. This poses a double challenge to the Crown in that it must not only accept the cost of developmental or exploratory work, but it must also be capable of enough self-discipline so as not to become too involved in the resolution of

the "contractor's" problems. Finally, because the prime contractor is responsible for any subcontracting, profit to the prime contractor involves a mark-up on subcontractors' costs, thus potentially increasing the cost to the Crown.

6.1.13 Effective functioning of TSIR requires agreement and understanding between the Crown and the prime contractor with respect to the key principles and terms associated with it. The lack of a common understanding will likely lead to conflict and will place heavy reliance on dispute resolution mechanisms. There is also a strong need to understand the prime contractor's capabilities and the nature of its relationships with its subcontractors. Additionally, it is important that TSIR not be used as a "stand-alone clause" in the contract. To be effective, all aspects of the contract need to be internally consistent. Processes related to financial controls, procurement plans, design reviews and QA/T&E must be consistent with the concept of "total responsibility" on the part of the contractor.

6.1.14 TSIR is less suited to high-risk, developmental projects because the Crown may not have sufficient understanding or capacity to articulate what is required and, in turn, may not be able to ensure that performance requirements are clearly communicated to, and understood by, the prime contractor. In general, for TSIR to be used as a form of risk mitigation in this kind of scenario, there should be mechanisms for timely sharing with the contractor of Crown experience and knowledge. This more interactive relationship, while not without its own risks, warrants consideration to offer opportunities for the contractor and the Crown to proceed to a stage where there is less uncertainty about the feasibility and performance characteristics of the solution to be delivered. Having progressed to a stage involving greater certainty, the project should then be more amenable to a TSIR approach.

7.1 Financial Management

Background

7.1.1 Overall, the prime contractor was responsible for designing, developing, producing and delivering 12 fully-supported frigates within a ceiling price of $6.2B (BY$). Prior to July 1994 – when an Overall Amending Agreement (OAA) was negotiated – the contract was a cost-reimbursable ceiling price incentive contract. The OAA converted the remainder of the contract to a fixed-price contract and changed the method of payment from one based primarily on bi-weekly progress claims to one based exclusively on milestones. At the time of the OAA, a total of seven ships had been delivered. All of these ships were behind schedule, and approximately $5.5B of the $6.2B prime contract budget had been spent. The contractor was assessed liquidated damages totalling $16.4M for the first six ships that were delivered late. Late delivery charges of $5.4M for the seventh and eighth ships were deferred and were included as part of the OAA negotiations.

7.1.2 In 1993, after several attempts at reaching agreement, representatives of DND, PWGSC and the prime contractor initiated actions that eventually resulted in the OAA. When the negotiations began, there were over 400 issues on the table, with claims submitted by the prime contractor in excess of $880M. The Crown, while concerned with the cost of these potential claims, ultimately saw advantage in de-coupling cost/liability from agreement on outstanding technical issues and work to be completed. This approach was seen as important to ensuring the progress of negotiations. Accordingly, the Crown decided that the technical discussions would exclude negotiation of cost on an individual item basis.

7.1.3 Before the OAA was negotiated, the payment schedules for the contract consisted of three major forms: advance payments, bi-weekly progress payments and milestone payments. Advance payments were made to the contractor at the beginning of each year and were drawn down by the end of the year with every second progress claim. From the prime contract award in 1983 to the negotiation of the OAA, advance payments totalled approximately $1.2B. At the time of the OAA, of the total $5.5B in expenditures on the prime contract, $5.3B had been paid as bi-weekly progress payments and advance payments. The contract had provided for $539M in profit if all contract performance factors were met. Profit was to be paid quarterly through a series of 80 milestones. Prior to the OAA, $200M had been paid in profit payments tied to 32 milestones. In addition to incentives and profit, there was a penalty clause for late delivery of up to a maximum of $2.7M per ship, $36.6M for the entire project.

7.1.4 To ensure that the critical relationship between cost, schedule and technical performance would result in the achievement of the project objectives, the CPF PMO staff monitored the work performed by the contractor. This monitoring of work progress was to be substantially achieved through the use of the Cost/Schedule Control System (CSCS), a contract deliverable. Progress on the design and construction was also monitored through observation by project management staff. The contract called for the implementation of the CSCS within the first year of the Project; however, the contractor experienced difficulties in validating the system's accuracy. In addition, re-adjustments to the CSCS were necessary following the OAA.

7.1.5 From our review, we noted that all advance payments were secured by letters of credit from chartered banks. In addition, all machinery, materials, equipment and works in process intended for inclusion in the finished work were considered Crown property the moment they arrived at the contractor's yard or other designated premises, or at any earlier time at which title was vested in the contractor. For payments made regarding any part of the work that had not become Crown property, the Crown held a lien in an amount not exceeding the cumulative amount of all such payments. As a further protection, the Crown held the deed of licence to the shipyard.

Finding

Financial Management --- Payment Strategy

7.1.6 The contractor was paid in accordance with the negotiated terms of the prime contract. However, these terms were such that, when schedule delays occurred on the Project, there was a change in the alignment between total payments and progress achieved. A concern was that this could shift financial risk in the direction of the Crown. During the course of the Project, the actual delivery of each fully operational ship was not as significant an event as we would have expected in terms of payments made. Costs incurred by the contractor did, however, play an important role in the payment process. Accordingly, and to the extent that costs incurred by the contractor were not a good indicator of actual progress, it was not clear that payments were appropriately co-ordinated with progress. This concern was exacerbated by the fact that the principal system for the reporting of contractor costs was not validated until well into the Project.

7.1.7 *The significant use of advance payments to the prime contractor as a cash management mechanism, highlights the importance of recent provisions affecting the Department's capacity to carry-forward capital funding from one year to the next. (The PMO has stressed that these advance payments were considered a management burden to the contractor, including the payment of interest.)*

7.1.8 With respect to our review of the CPF prime contract ($6.255B), we concluded that the contractor was paid in accordance with the payment provisions of the contract. To the extent that the CPF was a developmental project, the reliance on bi-weekly progress claims for the majority of payments to the contractor in the early to intermediate stages of the Project was appropriate. We did, however, have some reservations that this payment approach did not necessarily correlate payments with the actual progress made on the development of the ship, but rather was driven by costs incurred by the contractor. (The delivery of functioning ships is an ultimate indicator of progress.) We did note, however, that there was a good verification process in place to ensure that the contractor had incurred the costs being claimed. This payment methodology essentially reduced the contractor's risk, particularly when the Project fell considerably behind schedule. As indicated previously, at one point during the project, only seven complete ships had been delivered, yet $5.5B of the $6.2B prime contract had already been paid to the contractor – although profit paid under milestones was withheld.

7.1.9 Another potential exposure related to this payment approach was that the CSCS, an important management tool and principal, albeit not exclusive, vehicle for monitoring cost and schedule, was not fully utilized as intended**.** Our review indicated that the cost information could not be used effectively because the CPF PMO was experiencing difficulty with it; in fact, the system was not certified until well into the Project. Projected final costs of the prime contract – known as estimate at completion (EAC) – was one of the key outputs of the CSCS, but it was not considered reliable until the latter stages of the Project (1993/94). The CSCS was, however, useful in the determination of the EAC during negotiations for the 1994 OAA.

7.1.10 We had reservations regarding the extent of use of the advance payments provided for in the prime contract. During the life of the Project, advance payments to the prime contractor amounted to more than $1.2B, generating $49M in interest – $35M of which was returned to the Crown. Key considerations for the provision of advance payments include the need to assist the contractor with significant start-up costs or to facilitate it's obtaining more favourable borrowing terms. Given the significant start-up costs and the developmental nature of the CPF Project, the use of advance payments in the early stages of the Project would seem reasonable. However, the use of advances did not substantially diminish after the Crown negotiated for the second set of six ships. We recognize that each capital project has unique circumstances (e.g. the extent of use of advance payments) that influence contract negotiations between the Crown and prime contractor. *(In this instance, the PMO has asserted that a major element of these payments was to provide flexibility to the Department in managing its capital budget.)* This highlights the importance of new flexibilities afforded the Department by the Treasury Board regarding the amount of its "annual" budget that can be carried forward to the following fiscal year.

7.1.11 In relation to milestone payments, we noted that pre-OAA milestones were cumbersome, with as many as 30 types of deliverables per milestone and multiple technical Offices of Primary Interest (OPIs), including program management, construction, software and Integrated Logistics Support (ILS). *(The PMO states that this was done intentionally so that profit payments reflected progress in all areas.)* However, we believe this made it difficult to determine the overall degree of completion of many of the milestones. Post-OAA milestones were appropriately changed to reflect specific end deliverables (for example, Contract Data Requirements Lists (CDRLs) were not combined with the delivery of software or ship construction). We noted that the dollar values of the milestones associated with the delivery of key deliverables (i.e., ships) were not significant. However, to the extent that technical performance requirements and schedule adherence were not met, payments were withheld or delayed, or partial payments were made.

7.1.12 Details regarding the payment approach used in the initial provisioning spares contracts ($970M) and the CST project ($90M) are provided later in this report and in the report prepared by Coopers and Lybrand on contract management for the CST procurement.

Finding

Financial Management --- Reporting of Costs

7.1.13 In many respects, the CPF PMO has set a high standard in terms of financial reporting. We did observe, however, that associated project costs, consisting of items not required to be specifically budgeted by the CPF, were not brought together in a manner which captured and reported the full costs to the Crown. These would include, for example, PWGSC revenue dependency charges of $85M as well as $165M paid as part of a government initiative to assist a subcontractor. We also noted that reported project costs were reduced by $54M through credits attributable to interest on advance payments and rebates on insurance premiums. The Financial Administration Act requires that these funds be credited to the Consolidated Revenue Fund.

7.1.14 With respect to financial reporting, we found that, with a few exceptions, the CPF PMO's financial statements reflect the project expenditures that were under its control. However, there are other "associated" costs beyond the control of the CPF PMO and that have not been aggregated to provide a comprehensive view of federal government cost related to the CPF. Costs that can be attributed to the Project are detailed in the table below.

Table 3: Unreported Federal Government Costs

Entente to Assist Subcontractor		$165M
* DND	$165M	
Project credits:		$54
* Interest on Advances	$35	
* Insurance Rebates	$19	
Revenue Dependency Charges		$85
Total		$304M

7.1.15 Regarding costs incurred from a government perspective, the Entente, – an MOU negotiated between a CPF subcontractor, the Province of Québec and the Crown, – was an agreement to cover the cost overruns incurred by the subcontractor. The agreement provided a total of $228M to the subcontractor – $165M was paid by the Department from funds outside of the project and $63M was paid by the Province of Québec. Our analysis of the Entente excluded the costs associated with the Tribal Upgrade and Modernization Project (TRUMP), another DND major Crown project in the marine environment.

7.1.16 With respect to the reporting of costs under the control of the CPF PMO, we are concerned that project credits totalling $54M have been reported as a reduction to project costs**.** Interest on advance payments to the contractor ($35M) and rebates on insurance premiums (estimated at $12M – $19M) were received by the CPF PMO and recorded as a credit to project funds. These amounts have been identified in reports internal to the CPF PMO but have not been recorded separately in the DND Financial Information System (FIS). Government policy specifies that interest on advance payments and refunds of prior-year expenditures, such as insurance rebates, are general government revenue that should be credited to the Consolidated Revenue Fund (CRF) and not used to reduce project expenditures. We recognize that, regarding the proper accounting for interest payments, an apparent conflict between the terms of the prime contract and certain provisions of the Financial Administration Act (FAA) has caused confusion. This issue was first reported by internal audit in l994**.** *(Although the PMO was complying with the terms and conditions of the prime contract, we understand that it has been determined that the FAA takes precedence.)* We also noted that $85M was paid in Revenue Dependency Charges to PWGSC – amounts that were not required to be factored into the original TB approved funding for the Project. Revenue Dependency Charges are now budgeted for in major capital projects.

Finding

Financial Management --- OAA

7.1.17 The l994 OAA was negotiated between the Crown and the prime contractor to address over 400 technical and contractual issues which had arisen over several years. It involved a settlement of $323M and paved the way for continued progress. Particularly with respect to technical matters, it involved a thorough, constructive and realistic resolution of issues. We are, however, concerned that the PMO did not prepare a breakdown of costs relative to its own claims as one frame of reference for establishing its negotiating position. We also noted that the Crown's negotiating position may have been affected by the fact that most of the contract funds had already been paid out.

7.1.18 The OAA negotiated in 1994 addressed over 400 technical and contractual issues and resulted in a firm fixed agreement of $6.255B. This agreement mandated the contractor to deliver the last ships on time as well as to correct any outstanding deficiencies through work-to-go or warranty procedures. This settlement was beneficial to both parties for several reasons. Potentially very time-consuming and costly litigation to settle outstanding claims was avoided. Furthermore, both the Crown and the prime contractor agreed on the work that was still to be done and on the costs of resolving specific performance "deficiencies".

7.1.19 The OAA negotiations represented a high-risk situation because the settlement of many technical and contractual issues was deferred to the latter stages of the contract. While the settlement negated the need for potentially costly litigation and ultimately reduced technical risk, the timing of the negotiations increased the financial risk to the Crown. Notwithstanding the PMO view that the Crown was in a "good" position to enter negotiations, we are of the view that it could not be characterized as ideal given that most of the contract funds had already been paid out. This is not to discount that the prime contractor also had interest in arriving at a workable agreement**.** However, the number of contentious claims filed by the contractor, the length of time without a resolution, and the diversity of the issues involved, complicated negotiations and the risk of confrontation.

7.1.20 From a technical risk perspective, the process to identify issues was thorough, and the resolution by both parties was constructive and realistic. However, the Crown did not separately cost its own technical/contractual issues or its counter-claims to the contractor's demands. This would have provided one important frame of reference for the Crown to establish and guide its own negotiating position and to evaluate that of the contractor. The Crown team chose to negotiate the dollar settlement based on EAC costs and profit for the contractor −not on an item-by-item basis. In so doing, the Crown would share the costs of any past inefficiencies and accepted the risks of resolving some specific deficiencies. As a result, it is difficult to objectively assess whether the $323M cost of the OAA settlement was reasonable notwithstanding that the outcome was positive. It now remains a broad and largely subjective question involving trade-offs toward ensuring remaining ship production while avoiding a potentially protracted legal process.

Recommendations and Lessons Learned

Financial Management – Payment Strategy

7.1.21 Contract payment strategies should be designed to reflect a well-articulated definition of the changing risks associated with the different phases of a project. This should follow from our recommendation that the front-end of each project include a comprehensive definition of risk, and corresponding actions/strategies, for the full life of the project. Actions will include plans to ensure the availability of timely, reliable information consistent with the management of risks and to support payments to contractors.

7.1.22 Overall, the contracting strategy should provide for payments based on measurable performance, which should be linked to effective project and cost control systems. Payment strategies should be consistent with the unique risks affecting a project and its life-cycle. For example, contracts that emphasize reimbursement of contractor costs may not be suitable for all phases of one project. During the design/development and production phases of the lead ship, the main concern is to produce a ship that is technically compliant. Since both the Crown and the contractor may lack accurate historical data on costs, using a cost-reimbursable contract with a ceiling price may have been more appropriate in terms of sharing risks between both parties. For the production of follow-on ships, the main risk becomes the delivery of the ships within the established schedule and approved budget. At this point, it becomes more feasible to pay the contractor on the basis of the actual progress of the work.

7.1.23 When "measurable" performance is used as the method of payment, advance payments can be minimized or eliminated. If they cannot be eliminated, they should be linked to the contractor's actual cash flow requirements. Progress payments, wherever feasible, should be based on a well defined work breakdown structure/work packages. It is our view that, to complement this, a reliable CSCS must be validated early in the project, as it is a crucial component in project management – it is particularly vital to the payment process. Incentives could be provided to contractors to encourage them to validate such a system very early in the project. In addition, monthly reports should provide the most accurate data in terms of performance and costing details. Moreover, the use of cost and schedule information, in combination with a significant and meaningful milestone delivery schedule, would be an effective way to ensure that the payments made adequately reflect work achievements.

7.1.24 The use of incentives/milestones should be structured to motivate contractor performance. They should be tailored to specific objectives for each phase (for example, during the design/lead ship phase, the primary focus should be on performance and schedule, while follow-on ship production should place additional emphasis on cost control and schedule). Sufficient weight should be given to the timing and amount of milestone payments so that they reward key deliverables (e.g., successful final testing of a major component or system, ship acceptance). Greater emphasis on milestone payments that represent significant points on the critical path, coupled with the use of holdbacks, would reinforce the importance of schedule. Each milestone should contain deliverables that are measurable and linked to the QA/T&E process.

Financial Management ---- Reporting of Costs

7.1.25 The recommendations that follow recognize that, with the exception of confusion regarding the reporting of credits (refunds of prior years expenditures), the CPF PMO did a commendable job of reporting costs relative to the project budget. They also highlight that this budget was not inclusive of all related costs incurred by the Crown.

7.1.26 The CPF Project moved the yardsticks forward significantly with respect to the reporting of Project costs. However, from the perspective of the Crown, and in consideration of the results of our review of the CPF, we believe additional improvements can be made to the reporting of costs for MCPs:

- *All revenues or credits on previous-year expenditures accruing to MCPs should be recorded and reported separately to ensure their visibility to senior departmental management.*

- *Revenues or credits relating to prior-year expenditures or interest on advance payments should not be used to reduce project expenditures.*

- *Costs associated with a deliverable should be reported against the appropriate budget element.*

- *All project costs, including those incurred outside the CPF PMO, should be aggregated and reflected in the total cost of the project (associated costs can be identified as such).*

- *The tracking of adjustments to funding levels, based on a comparison of forecasted escalation rates to actual inflation - as practised internally by the CPF PMO - is commendable and should have broader application in the Department.*

Financial Management -- OAA

7.1.27 The PMO has emphasized the importance of well-designed contract dispute resolution mechanisms to avoid the accumulation/deferral of complex issues over time. We recommend that this be incorporated in risk management strategies.

7.1.28 Risks to the Crown in contract negotiation can be reduced in several ways. Although there was a contract clause that permitted work to continue in spite of a dispute, we believe this clause should be expanded in future contracts to encourage the resolution of disputes earlier in the contract schedule. Accumulating claims – by either party to the contract – hinders the development of good working relationships and leads to higher risk in the settlement process. Furthermore, it is imperative that adequate technical, quantitative and qualitative information be available as a baseline for negotiations between the Crown and the contractor.

8.1 Quality Assurance/Testing & Evaluation (QA/T&E)

Background

8.1.1 The contract for the CPF assigned responsibility for all aspects of QA, including T&E, to the prime contractor. Under TSIR – with the exception of a few directed fits – the contractor was required to identify all of the main systems to be incorporated in the ship and to ensure that they were integrated. There was a conscious effort to reduce the project risk by incorporating, where possible, systems that were already proven products. Consequently, vendors were required to demonstrate to the prime contractor that their product performed in accordance with the vendor's stated specifications.

8.1.2 The contract, however, preserved the rights of the Crown to approve the Trials Index and the detailed Trials Agendas developed by the contractor, to witness all QA events, and to accept trial results. The approved Trials Index included over 720 significant tests and trials, each with its own specific agenda. As confidence in the systems developed and as performance was demonstrated, many trials were reduced to Installation Inspections and Technical Acceptance Verification procedures.

8.1.3 The development of the trials program consisted of a consultative process spanning several years, with all major systems included in the trials program. The contractor's proposals were considered by functional OPIs within the CPF PMO and by systems engineering staff within DND headquarters. Many of these personnel were also involved in witnessing Factory Acceptance Tests (FATs) and trials. Some 56 trials were "first in class" and were performed only on the lead ship or an alternate ship, while the remainder were performed on all ships until the Trials Index was modified.

Finding

8.1.4 We found the QA/T&E regime for the CPF to be well conceived and executed. It was appropriately focused on high risk areas and it demonstrated high stakeholder involvement

8.1.5 Based on our review of the QA/T&E processes, activities and case files, we conclude that QA/T&E were key factors in ensuring that the contracted capability for the CPF was achieved. During our analysis of a statistical sample of the 720 tests and trials, we found QA/T&E processes to be comprehensive and well documented. In addition, there was a high degree of stakeholder involvement in the determination of the Trials Agendas, in the witnessing of trials and in the approval of reports. Testing was comprehensive, and high-risk components and systems were given increased focus. In addition, trials conducted by the contractor were witnessed by either the CPF PMO or other appropriate personnel within DND. Moreover, the reporting and tracking of deficiencies and outstanding items were thorough, and continued even after acceptance of the ships by the CPF PMO and upon their operational transfer to Maritime Command (MARCOM).

8.1.6 The element that we considered most crucial to the QA/T&E process was the focus on high-risk areas in development. Testing during the lead ship phase was rigorous and necessary to demonstrate overall systems capability; however, each ship was tested to provide assurance that it met the contracted capability requirements. The practice of focussing on high-risk areas at critical points during the project, and the rigorous testing of all ship's systems during lead ship trials, should be continued.

Recommendations and Lessons Learned.

8.1.7 The CPF is cited as a positive example in the CRS Report on the Management of Equipment Testing and Evaluation in DND. Our recommendation is that QA/T&E be designed very early in the project based on a risk management plan addressing the full life cycle of the equipment acquisition and delivery into service.

8.1.8 While noting that the trials process was comprehensive, we also noted certain areas having room for improvement. We found some instances where there was an over-reliance on QA procedures in the selection and qualification of component systems. In other cases, T&E procedures started too late to optimize their impact on the reduction of risk. In selective areas, the reliance upon vendor and contractor QA procedures, and the lack of independent testing during the development period, meant that some weaknesses and unsatisfactory conditions were not discovered until it was too late to avoid costly solutions.

8.1.9 The lack of development and operational testing of some equipment and systems prior to agreement on the detailed design phase of the contract, contributed to increased life-cycle maintenance problems and costs. The decision not to bench-test certain components that had well-known technology was a conscious trade off between performance risk and the cost of testing the component during the development phase. In addition, the early start of construction of the first ship prior to completion of the detailed design may have influenced the decision not to test certain systems. It is also possible that the underlying TSIR requirements of the contract may have created the perception that the Crown's role was restricted in the early stages of design development and testing of the CPF project (as explained in subsection 6.1).

8.1.10 Recent media reports have indicated that certain difficulties have been experienced, particularly with respect to CPF and Tribal Class missile firings. It would appear that these difficulties are attributable to a combination of factors related to operator training and technical attributes that were experienced in 1997 during exercises designed to test weapons systems at extended ranges in combat-like scenarios. Our work, which was substantially conducted in 1995, has not positioned us to provided independent comment on these more recent developments. Worthy of note, however is the caveat offered by the Centre for Security Strategies and Operations, that, "…the combat effectiveness of a complex weapons system under the stress of combat is difficult to measure." [1] It is difficult for an equipment testing and evaluation regime to anticipate all potential combinations of operator, equipment and environmental interaction and conditions. Notwithstanding this positive overall assessment with respect to QA/T&E, our review did identify opportunities for improvement. Given that our field work was substantially completed in l995, we are not in a position to offer independent comment on recent media reports dealing with difficulties affecting missile firings.

[1] Center for Security Strategies and Operations , the research and analysis arm of TECHMATICS, a US technology , engineering and professional services firm, conducted an analysis of frigate type warships in July 1997.

9.1 System Integration Software Development & Documentation

Background

9.1.1 One of the most challenging aspects of the CPF Project was the development of integration software for combat and marine systems. In accordance with government direction, combat system procurement and integration was subcontracted by the prime contractor to a new Canadian firm created to establish a Canadian centre of electronic integration expertise. The technical complexities associated with this software development contributed to significant schedule delay and the withholding of $4.1M in profit payments. The prime contractor was given notice of material breach of contract, in January 1985, regarding the schedule for preliminary design reviews. Work-around plans for system integration, proposed by the prime contractor, were accepted by the Crown, and the prime contract was amended accordingly in April 1986.

9.1.2 In February 1988, the prime contractor was again given notice of material breach which the Crown attributed to poor configuration management of the software design requirements. The Crown had observed that software module requirements could not be traced to the certification test plans. Progress payments were ceased in April 1988 and an MOU was put in place by August 1988 withholding $2.0M profit until the contract was amended to include a more detailed software requirements list. The MOU provided for the co-location of the Crown with the responsible subcontractor, in order to work through the integration complexities and get the project back on schedule.

9.1.3 By April 1990, it was realized that the combat system integration would not be completed in order for the lead ship to be accepted. Once again, the prime contractor was placed in material breach for missing vendor software documentation and unsatisfactory certification/integration test procedures resulting in a holdback of $2.0M in progress payments. Thirty software modules were identified by the Crown to be re-certified prior to further integration testing. In order to resolve the technical difficulties, the CPF PMO acquired the assistance of the Mitre Corporation, an independent US non-profit agency specializing in software integration for the US Defense Department Command, Control Communications and Intelligence, and the US Federal Aviation Administration. With the advice of the Mitre Corporation, a software Work-Around Plan was accepted by the Crown in July 1990; it allowed for phased release of the CPF software – a 12-ship solution – rather than a final release of software for the lead ship. The prime contract was amended to delay milestone profit payments and to provide for the provisional acceptance of the lead ship in June 1991 with the early release of software with recognized limitations. After several years of certification and regression testing witnessed by the Crown, there were 35 releases of combat system software and 11 releases of the integrated marine control system software before the Crown gave final acceptance of the CPF software in 1995.

Findings

9.1.4 Significant delays were experienced in the development of integration software. This was a key area affected by early difficulties with the application of the TSIR contracting strategy and attendant management processes. The high level of integration was ambitious and the challenges involved were likely underestimated. However, the ultimate deliverable marks a central capability of the Frigate.

9.1.5 Major difficulties in the development of the system integration software, including overly optimistic time lines, resulted in significant delays – a common occurrence with major information technology projects. In addition, the magnitude of design complexities for the real-time integration of 13 sensor systems and nine major weapon/decoy systems was likely underestimated. We observed that current frigate projects in NATO span a period of nine years from requirements definition to acceptance of the lead ship. The CPF Project attempted to achieve a high level of systems integration over an eight-year period. This optimistic schedule was driven by an operational requirement to replace outdated steam-driven destroyers. Despite the delays, an agreement was reached between the Crown and the prime contractor to revise the software development process and to amend the milestone schedule. As discussed in paragraph 6.1.3, the "negative guidance" approach to software design made it difficult to achieve resolution of technical problems. Although the rigorous design and testing reviews performed by the CPF PMO contributed to schedule delays, we believe these reviews also resulted in a high level of confidence that software design specifications were achieved. (*The PMO offers the reasonable caution that too much emphasis should not be put on technical difficulties associated with software. It is pointed out that the companies involved would submit that the Crown was in large measure, or perhaps completely, responsible for imposing procedural impediments on software design/development that caused the delays and overruns in this area.)*

Recommendations and Lessons Learned

9.1.6 We endorse and recommend the PMO's use, if not the timing, of independent expertise to challenge its approach to the management of software development. We recommend the periodic application of such independent expertise at key points from the inception, and throughout the life cycle, of major software development projects.

9.1.7 The problems experienced by the CPF with respect to software development were not uncharacteristic of large information technology projects in the 1980s and thereafter. In responding to these challenges, it was a sound management practice to acquire independent expertise from the Mitre Corporation – seeking alternative solutions or confirmation of the CPF PMO's plan of action. If feasible, such software development expertise should continue to be sought until the product is delivered in order to supplement the limited resources in a PMO.

9.1.8 Software development processes have evolved since the start of the CPF Project. The 1983 contractual "waterfall" concept – the sequential process of software design, coding, certification testing, and integration – did not provide for overlap in each developmental phase. An effective modification to software development was reached in the 1988 MOU between the Crown and the prime contractor, which permitted concurrent engineering in each phase of

development. In order to streamline the software development process, the Crown reduced the number of formal preliminary and critical design reviews before the testing phase. It was also recognized that a single release of a warship software product would not be achievable given the magnitude of the integration task. Rather, a software product baseline was established in the project, and then further developmental phases were applied in order to improve the product in subsequent releases.

10.1 Initial Provisioning (IP)

Background

10.1.1 Consistent with the TSIR contracting philosophy, the prime contractor was given responsibility for the procurement of IP spares for the first six ships. Approximately 1,671 contracts were awarded by the prime contractor on behalf of the Crown, for a total contract value of $605M. In the second phase of the Program (SRP 2), there were an additional 795 contracts valued at $323M. However, the Crown negotiated these latter contracts directly with the original equipment manufacturers (OEMs). Although the project was not entirely complete and final figures were still pending at the time of our review, spares acquisitions for approximately 60,000 line items are expected to be within the approved $970M IP budget.

10.1.2 Although the prime contractor was responsible for spares procurement for SRP 1, the Crown still had an active involvement in the more than 1,100 Initial Provisioning Conferences (IPCs) conducted by the contractor. The prime contractor determined the recommended volume of IP and DND had the opportunity to make adjustments to quantities prior to actual procurement. In addition, the Crown sought to reduce risk by developing and deploying a PMO inventory system to monitor contract demands and receipts. As part of SRP 2, the Crown created mechanisms to provide for greater involvement of the Crown in the procurement as well as in the physical protection of, and accounting for, materiel assets.

Findings

10.1.3 Procurement of IP spares through the prime contractor for the first six Frigates had important benefits in terms of managing risk. It also involved added costs of about $144M. While not questioning the appropriateness of this procurement strategy, we did not find a costed supporting analysis. We also found that the prime contract did not include clear incentives to ensure that the contractor obtained the best price for spares acquired on behalf of the Crown. We estimate that the procurement strategy for the second six Frigates will result in savings of as much as $56M. Although early in the CPF life cycle, we also questioned the slow rate of usage for certain spares. Additionally, and without finding any evidence of materiel loss, we noted that improvements could be made in procedures for the receipt, payment and physical control regarding spares.

10.1.4 We determined that the CPF Project was successful in procuring sufficient spares through the use of the projected replenishment requirements based on a life cycle of 10 years for combat systems and 30 years for marine systems. Furthermore, we consider that, until the CPF design was established, technical risk was reduced by having the contractor involved in the spares provisioning process. As a result, the contractor was accountable for ensuring an adequate supply of the correct spares on a timely basis. While there was a cost associated with this approach, costs were reduced in SRP 2 by having the Crown assume the risk for procurement.

10.1.5 The Crown avoided the risk of late delivery of initial provisioning – a situation that we understand had affected the DDH 280 class of ships – and prevented the compromise of configuration control. However, procurement of CPF spares by the prime contractor for the first six ships resulted in additional tiers of management overhead and profit, which added an estimated $144M to the initial provisioning costs. Direct procurement by the Crown from the OEMs for the last six ships achieved $80-$100M in cost avoidance. This was partially offset by NDHQ personnel augmentation costs of $44M, for a total net savings of approximately $36-$56M for SRP 2.

10.1.6 For the first six Frigates, the Crown did not include clear contractual incentives for the prime contractor to obtain the best price available for spares. Negotiations conducted by PWGSC CPF PMO staff for the procurement of $589M of spares were successful in reducing original bid prices on bulk or common items by 11 per cent on average. These negotiations also convinced the prime contractor to break out the common bulk items into a single contract. However, our detailed analysis using the "Haystack" commercial database of 2,100 line items procured for the CPF, indicated that further savings were feasible on 239 line items. We did not find an analysis by the PMO that assessed the costs and benefits of the approach to procuring spares for the first six ships. This may have led to consideration of incentives to encourage the contractor to achieve best price. However, it is important to note that the technology we used to perform our limited price analysis did not exist during most of the period in which the spares were procured.

10.1.7 At the time of our assessment, the Frigate had been in service for approximately four years and all of the first six ships had served on extended operational tours. Although it is early in the CPF life cycle, our assessment of the 21,000 CPF unique line items, held on ships and at shore facilities, found that there has been no usage on approximately 10,600 line items accounting for a dollar value of $36M, or seven per cent of the total value of the 21,000 items. The majority of these unused items were consumable (Class C or D accountability) and were to be expended in three years. This may indicate a potential surplus of inventory over the longer term. Notwithstanding that this is a relatively low level of inventory, it should be monitored, as there will be costs associated with warehousing and disposal should these spares prove to be surplus.

10.1.8 Although we could find no evidence of materiel loss, we observed that in some instances DND could not demonstrate that it received spares for which it had paid. Evidence of receipt of deliverables was in some cases not provided to the CPF PMO prior to certification for payment in SRP 1. This situation has been remedied. In addition, the sampling approach for verifying the receipt of spares at the delivery point required improvement. *(The PMO indicates that the prime contractor was responsible for all functions of procurement activity. The PMO did however hold copies of spares receipt vouchers and, for those vouchers that could not be produced at the time of the review, the receipt of the materiel has been verified by the PMO.)*

10.1.9 DND cannot be assured that all shipboard CPF spares recorded in the Canadian Forces Supply System (CFSS) have been accurately accounted for. At the time of delivery of spares, problems with the prime contractor's inventory information system affected the value of the spares recorded in the CFSS. Efforts were made by the CPF PMO to correct the value of CPF-unique spares data in the CFSS. However, at the time of the review, additional discrepancies were noted. We also found that procedures for registration of SRP 1 shipboard spares inventory in the CFSS were deficient. This resulted in materiel accounting records being adjusted totalling $151M, without the documentation and appropriate approvals to permit these corrections. This adjustment was to correct an input error whereby six ship-sets of spares were charged to one ship. It remains the case, however, that our audit tests did not find evidence of materiel loss. It should also be noted that registration procedures incorporated for SRP 2 shipboard spares significantly improved inventory control.

Recommendations and Lessons Learned

10.1.10 We recommend that decisions regarding the sourcing of initial provisioning spares be supported by a well-defined risk management strategy and a costed analysis and that advantage be taken of new technology which facilitates access to pricing information. Improved procedures are also required to enhance and co-ordinate controls in those instances where a contractor procures spares on the Crown's behalf.

10.1.11 In large capital procurement projects, it is not unreasonable that initial procurement be contracted to the prime contractor. However, once the configuration is established, the Crown could initiate procurement directly from the recommended suppliers to reduce tiers of overhead and profit. The prime contractor's role might then be limited to the identification of both potential suppliers and proposed initial provisioning requirements. Alternatively, contractual incentives should be designed to promote additional economies in the purchase of spares. The Crown should retain the capability to verify supplier usage projections and to adjust the recommended quantities accordingly.

10.1.12 To achieve better pricing in IP, the Crown should take advantage of enhanced pricing research technology, using the "Haystack" database for instance, for those combat systems with proven subsystems, to negotiate best prices early in the initial provisioning process. Furthermore, the prime contractor responsible for spares procurement should be requested to identify common bulk items as a means of improving economies of scale.

10.1.13 We also recommend that improvements be made in the receipt, payment and physical control processes related to spares. To ensure that payments are made only for spares that have been delivered, PMOs should streamline the payment process and develop well-defined criteria for the receipt of spares at contractor-located delivery points. When spares are procured through a prime contractor, PMOs should register all delivered spares inventory in the CFSS just prior to the delivery of the combat systems. In addition, they should verify contractor inventory management data integrity with PMO materiel information systems prior to uploading the CFSS. To improve the protection of the initial provisioning procured through a prime contractor, PMOs should consider a physical verification with an adequate sample size and dollar value just prior to delivery of the combat system. It should also be standard procedure to electronically match the contractor inventory information system quantities and item location with the CFSS quantities and location identifier at the time of delivery.

Part 2 – Assessment of Specific Concerns: CPF Project/Contract Management

11.1 Introduction

11.1.1 This portion of the Review assesses alleged weaknesses in contract management practices, processes and transactions. The review of these concerns was carried out within the context of our internal audit of the CPF contract management framework. DND and PWGSC conducted an assessment of 44 specific concerns raised by several individuals regarding contracting practices – many of which were communicated to us in the form of a question. A detailed analysis of each specific concern is presented in Annex A. These concerns may be categorized as follows:

- ***Quality Assurance/Test & Evaluation:*** possible inadequacies in the QA/T&E regime and the cost effectiveness of the QA/T&E process.

- ***Technical Non-compliance:*** contract changes that may have substantially increased costs, decreased the scope of work and/or compromised configuration control, the adequacy of the contract change process and/or compliance with the prescribed process.

- ***Contract Non-compliance:*** possible non-compliance with contract conditions and payments being made in the absence of contracted deliverables.

- ***Software Development/Software Documentation:*** problems and delays in the development of integrated combat and marine systems software and documentation, including payments for deliverables possibly not in accordance with the contract.

- ***Warranty:*** the adequacy of warranty provisions and the possibility that inappropriate payments were made.

- ***Initial Provisioning:*** possible irregularities in the contracting process, shortfalls in sparing, the bypassing of the contracting process to obscure the true project cost, and the questionable pricing of spares.

11.1.2 We found sufficient information to refute, or found insufficient substantiation for, to conclude that 33 of the 44 concerns had no merit. We also found that there was sufficient information to substantiate nine concerns that had some merit at a particular point in time during the Project; however, in most of these cases, the CPF PMO was aware of the issues and had taken action. The remaining two concerns with merit were found to have little adverse impact on the Project. Notwithstanding the considerable knowledge we have acquired regarding this Project, ten of the concerns were unclear as to meaning. Accordingly, we found it necessary to state assumptions as to the likeliest. We also noted that information provided by complainants to support certain of the concerns was not accurate, complete or current. Some concerns related to

the payment for incomplete deliverables were raised due to a misunderstanding of the contract provision for payment of costs incurred and the subsequent payment of the profit upon completion of the particular milestone. Additionally, a number of concerns were resolved as part of the 1994 OAA negotiated between the Crown and the prime contractor. Based on the results of our review, we concluded that these concerns do not warrant further action at this time. One exception is Concern No. 3, Payments for a Deficient Weapon System, which will be pursued outside the CPF Review.

11.1.3 During the review, a concern was expressed by a team from the Office of the Auditor General regarding the CPF combat system software safety analysis. This issue is not addressed as part of this current review of the CPF. This concern is further discussed at paragraph 14.1.10 of this report.

12.1 Review Methodology

12.1.1 Each of the 44 concerns was subjected to an initial assessment. This was to clarify its meaning and to assign responsibility to the appropriate player(s) within the CPF Review. A detailed examination was then undertaken to assess the validity of the concern.

12.1.2 In addition to the context provided by the discussion of systemic issues in Part 1 of this report, other pertinent components of the CPF prime contract are discussed in the following subsection. An appreciation of this additional context is essential to both situate and assess the validity and materiality of the specific concerns. A summary of conclusions for each category of concern has also been developed to identify cross-linkages and to explain why some of the matters may have been raised.

13.1 Additional Background - Other Key Components of the CPF Prime Contract

Contract Amendments

13.1.1 The CPF Implementation Contract has been affected by essentially four fundamental revisions.

- the initial phase, known as SRP I (1983), provided for the initial design, construction and delivery of six frigates on a cost-reimbursable target incentive basis at a ceiling price of $3.5B.

- the second phase, or SRP II (1987), provided for six additional frigates and amended the ceiling price to $6.2B.

- the Provisional Acceptance Amending Agreement (PAAA) of 1991, provided for provisional acceptance of the lead ship, pending completion and acceptance of the combat system software, with no change in either the total price or the basis of payment.

- the 1994 OAA, which among other things, converted the basis of payment to a firm price of $6.255B, removed all profit incentives, settled a number of outstanding technical issues and claims between the Crown and the contractor by means of waivers, and established a new limitation on the contractor's liability under warranty.

Total System Integration Responsibility

13.1.2 At the time of its inception, the CPF Project was the first Canadian naval warship construction project undertaken since the new DDH 280 construction ended in l973. The prime contractor was responsible for integrating all aspects – hence TSIR – of a complex, multi-purpose warship the likes of which had never before been built in Canada. This represented a unique risk environment as the role of industry in past warship procurements was to a large degree that of producer of government-designed ships, with the government essentially playing the role of prime contractor. Under the CPF Project, industry developed the design of the warship based on government performance requirements and, as such, was responsible for ensuring that the design resulted in CPF systems that met or exceeded performance requirements.

Method of Payment

13.1.3 Until the OAA, the payment method consisted of three major forms: advance payments, progress payments and milestone payments. Advance payments were made to the contractor at the beginning of each year and were drawn down with every second progress claim. Bi-weekly progress payments were made based on actual costs incurred. Finally, profit was paid through a series of 80 milestone payments, with the contractor being required to successfully complete a milestone before receiving payment. The OAA converted the method of payment to one based solely on milestone payments. It should be noted, that at the time of the OAA, all advance payments had been made.

Penalties

13.1.4 Until the OAA, in the event of late delivery of any of the ships or the Combat System Test and Support Facility (CSTSF), liquidated damages would be assessed to a maximum of $3.12M per ship and $2.73M for the test facility – to a maximum of $36.6M for the entire project. If the final cost of the prime contract exceeded the target cost of $4.656B, the target profit of $539M was also reduced by 20 per cent of the costs above the target cost. As well, there were penalties for under-achievement of industrial benefits. The OAA removed these provisions from the contract.

Quality Assurance/Trials & Evaluation

13.1.5 The contract assigned responsibility for all aspects of QA, including T&E, to the prime contractor. The Crown reserved the right to approve the Trials Index and the detailed Trials Agendas developed by the contractor, to witness all QA events, and to accept the trial results. Under the TSIR contracting philosophy, with the exception of a few directed fits, the contractor was required to identify all of the main systems to be incorporated into the ship, and to ensure that they were integrated. The contractor was also required to conduct trials on each ship in order to demonstrate that its systems and subsystems and each shore facility met or exceeded the performance requirements set out in the applicable specifications. If the work was found to be defective or otherwise not in accordance with the contract, the contractor was required to see to its correction. Final acceptance by the Inspection Authority did not relieve the contractor of its obligation to resolve deficiencies recorded at the time of final acceptance.

Warranty

13.1.6 The prime contract required the contractor to warrant that:

- the lead ship be free from all faults or defects in design for a period of three years after delivery and provisional acceptance thereof (reduced to a period of two and one half years at the time of OAA).

- each deliverable end item be free from all defects in materials and workmanship for a period of one year after delivery and provisional acceptance thereof.

- the lead ship perform in accordance with all performance requirements contained in the CPF System Specification for a period of three years after delivery and provisional acceptance thereof.

- the CPF project achieve total system integration **C** free from defects **C** for a period of one year after delivery and acceptance of the last deliverable end item.

13.1.7 Until the OAA, at which time the contract was converted to a firm price, the contractor was required to remedy a defect during the warranty period and was reimbursed its direct and indirect costs, without profit, up to a predefined limitation. Additionally, for defects resulting from faulty design, the contractor was required to apply the proceeds from the Professional Liability Insurance claims to offset the costs associated with remedying such defects. The cost of repair or replacement of faulty materials or workmanship was covered under the Marine Builders' Risk Insurance after launch and by Shore-Based Builders' Risk Insurance for shore-based work.

13.1.8 Before the OAA, the prime contract included warranty incentives designed to encourage the contractor to achieve technical excellence so that warranty claims could be minimized and profit maximized. Dollar caps or target incentives were established in each of the four warranty areas. For the purposes of assigning and billing warranty costs and for determining

any additional profit payable under the incentive arrangement, a warranty formula or "shareline" of 80/20 was established, whereby the "contractor's share" accounted for 80 per cent of the total warranty costs and the "Crown's share" accounted for 20 per cent. Costs claimed under the contractor's share were accounted for within the ceiling price, while costs under the Crown's share were paid outside the ceiling price, although they were accounted for in the overall project cost. If the cumulative amount of the contractor's share at the end of the warranty period was less than the target incentive amount, the Crown would pay the contractor the difference as additional profit, as long as the ceiling on profit or the overall contract ceiling was not exceeded. In essence, every dollar accounted for under the contractor's share would reduce the contractor's additional profit by the same amount.

13.1.9 The contract also included dollar limitations on the contractor's liability in each of the four warranty areas. Until the OAA, the 80/20 shareline arrangement was used to "assign" warranty costs, with 80 per cent of such costs being counted toward the dollar limitation. That is, if the contractor's share (80 per cent) of warranty costs reached a limitation before warranty was deemed to have expired on its own terms then, notwithstanding such terms, the warranty in that particular area would cease to exist.

13.1.10 The provisions of the OAA:

- removed the warranty profit incentives.
- closed out the design and performance warranties.
- established a new omnibus dollar cap on the contractor's liability vis-a-vis the materials and workmanship as well as the TSI warranties, with the contractor being responsible for 100 per cent of warranty costs up to the limitation.

Warranty will expire if the dollar cap is reached (unless it has already time expired), and any work required to remedy defects would be the Crown's responsibility as it would be considered outside the scope of the CPF contract. If the warranty time period expires and the dollar cap is not reached, the contractor will retain, as additional profit, the difference between the dollar cap and the actual warranty costs.

Contract Changes

13.1.11 In accordance with the contract, contract changes can be directed by the Contracting Authority or proposed by the contractor. The Crown is under no obligation to agree to a change proposed by the contractor but must, within 15 business days of receipt of the documentation related to a change, either approve the change, commence negotiations with the contractor or reject or withdraw the request for change. If the parties fail to come to an agreement on an adjustment to the contract price or to the technical or delivery requirements, the Crown may still direct the contractor to proceed with a change while negotiations continue. A ceiling price is established so that work can proceed and the contractor can be reimbursed for the costs that it

incurred. The contractor is not required to perform work or entitled to recover the cost of such work if the cost exceeds the ceiling or if it is incurred after a date fixed by agreement between the two parties. Regardless of which party initiates the change, the contractor is not entitled to payment for additional work unless a change is approved by the Contracting Authority.

13.1.12 Change Control Forms (CCFs) and CCPs are two of a number of administrative mechanisms for processing changes to configuration items. Class I changes affect fit, form or function, and are effected using CCPs; CCPs require Crown approval as well as an amendment to the contract. CCFs facilitate Class II changes; they do not affect fit, form or function, and do not require Crown approval or a contract amendment. The contractor submits a CCF to the Crown and, if the Crown does not dispute the classification of a change as a Class II change within 10 business days of receipt of the CCF, the change is deemed to have been confirmed as a Class II change.

13.1.13 Schedule A, Part 2 of the prime contract comprises the Configuration Management Plan (CMP), which provides the identification, controlling, accounting and auditing process necessary to manage technical baselines to ensure design integrity throughout the contract. The CPF configuration management process described in the CMP was designed to:

- ensure control of governing documents such as specifications and drawings.
- recognize the impact of changes on performance, cost and schedule.
- ensure that changes are processed in a timely fashion.
- maintain configuration item status so that interfaces are maintained between systems, equipments and software.

In this regard, the contract requires the contractor to provide a quarterly Change Proposal Status Report. It also requires that configuration audits be carried out on the first of each configuration item procured or produced to verify compliance with contractual requirements and to ensure that the item has achieved its required performance level.

14.1 Summary of Conclusions Related to Specific Concerns

Quality Assurance/Test & Evaluation (Concerns No. 17, 23, 24 (Annex A))

14.1.1 Three specific concerns suggested possible inadequacies in the QA/T&E regime in terms of circumvention of procedures and questionable costs. Based on our review of the QA/T&E processes, activities and case files, we conclude that, in fact, QA/T&E functioned well and was key to ensuring that the contracted capability was achieved. See Section 8.1 for more details.

Technical Non-Compliance (Concerns No. 3, 4, 5, 8, 10, 13, 14, 15, 27, 33)

14.1.2 Ten specific concerns related to contract changes that were alleged to have substantially increased costs, decreased the scope of work and/or compromised configuration control. The underlying theme of these concerns suggests inadequacies and non-compliance with the contract change process. However, there is sufficient evidence to refute these specific concerns.

14.1.3 As of May 1995, there were 658 CCPs approved by the Crown, in accordance with the terms of the contract. Of these, 608 were not cost related; while the remaining 50 increased the total contract value by $83M, or 1.3 per cent of the contract value. Both DND and PWGSC review staff sampled a number of CCPs to determine whether there was merit to the concerns raised. While we can understand, from a technical perspective, how some of these concerns may have arisen, we concluded that there were defensible reasons for raising the CCPs. More specifically, the performance specifications originally incorporated in the contract, considered technically feasible at the time, likely underestimated the rate of technological advancement. In other cases, the contract specifications proved to be unachievable. Accordingly, specifications were changed over time to reflect these realities, and the changes were actioned by way of CCPs.

14.1.4 Our review of the contract and internal procedures indicated that the CPF PMO had established the requisite management control framework to manage contract changes and to ensure that the integrity of the configuration control process was not compromised. As mentioned in paragraph 13.1.13, the CMP, which forms part of the contract, is designed to provide the identification, controlling, accounting and auditing processes necessary to manage technical baselines to ensure design integrity throughout the contract. Contract changes, including those related to software integration, are tracked using the Configuration Management System (CMS), an automated management information system. The contractor is required to provide a quarterly Change Proposal Status Report, which is generated by the CMS.

14.1.5 An integral part of the management control framework is the CPF Contract Change Board, which ensures that all aspects of proposed CCPs are reviewed, evaluated, and approved or disapproved. The Board includes the CPF Program Manager, the PWGSC Director of Procurement, the Industry Canada Manager, the DND sponsor and the PWGSC sponsor. The DND sponsor is responsible for ensuring the completion of a DND Change Impact Analysis for each proposed change, in consultation with other DND stakeholders. This analysis examines the impact of the proposed change on such things as cost, integrated logistics and quality assurance. The PWGSC sponsor conducts a similar analysis from the perspective of PWGSC.

14.1.6 In summary, we have concluded that the CPF PMO adhered to the contract and to the CCP process. Based on a sample of CCPs, we found no evidence to indicate that CCPs representing a descoping of work were approved without a corresponding adjustment in price.

Contract Non-Compliance (Concerns No. 11, 31, 32, 34, 39, 40)

14.1.7 Six specific concerns pertained to possible non-compliance with contract conditions. Based on our review, we have concluded that the concerns were either not material or had no substance. These concerns suggested that the CPF PMO was not managing the project in accordance with the terms of the contract, particularly with regard to the development of the combat system software (see paragraph 14.1.8). Due to significant delays in the delivery of software integration deliverables, several software development agreements were reached with the contractor that, while not relieving the contractor of its contractual obligations, permitted work to proceed. In due time, the contract was amended to incorporate the undertakings detailed in these agreements.

Software Development and Documentation (Concerns No 1,2, 6, 7, 9, 12,16, 19, 20, 25, 26, 28, 29)

14.1.8 Thirteen concerns focused on problems and delays related to the development and integration of complex combat weapons, sensors and marine systems, including software and software documentation. They suggested that the Crown paid for deliverables associated with the delivery of software and related documentation that had either not been received or were not in keeping with the contractual requirements. In most cases, there was insufficient evidence to substantiate these concerns. The three major parties involved **C** the prime contractor, the major subcontractor and the CPF PMO, with the help of the Mitre Corporation **C** reached an agreement that allowed them to work together to resolve the difficulties.

14.1.9 The payment process for the prime contract provided for payment for work performed without a requirement that deliverables be finalized prior to payment. However, to the extent that technical performance and schedule were not met, milestone profit payments were withheld or delayed. Additional details on payments are provided in Part 1 of this report. It is important to note that a number of such concerns regarding the delivery of software development and documentation do not appear to take into account these contract payment provisions. Although progress payments were not tied directly to deliverables, the CPF PMO did take steps to ensure that software and related documentation were received. In that regard, software design and documentation deliverables were tracked using an automated documentation monitoring system, and they were rigorously reviewed prior to acceptance. Often there were delays in receiving final copies of design documentation due to the design changes required as a result of the testing regime. In other cases, the prime contractor was unable to secure proprietary technical data from the OEMs, thus requiring the Crown to enter into licensing agreements directly with the OEMs to obtain the required documentation. We found that ship crews, fleet schools and MARCOM software maintenance staff were satisfied with systems integration and with the availability of the necessary documentation for training and software upgrades.

14.1.10 Although the Mitre Corporation's recommendations were important in resolving the system integration difficulties, the CPF PMO did not act on all of them. With respect to a Mitre recommendation to acquire an external combat system software safety analysis to accommodate an upgrade of a US military safety specification, the CPF PMO was satisfied with the safety analysis done by the prime contractor. The PMO advises that Mitre could not recommend an agency with the competence to perform this analysis. Rather than incur additional costs, the CPF PMO supplemented the built-in CPF safety system with standard Navy operational safety procedures. (Although the QA/T&E regime for the CPF was well conceived and executed, the OAG team has recommended that review work be conducted to assess whether further testing is necessary to ensure that the combat system software is safe.) (*The PMO suggests that the CPF combat system software constitutes the most examined/tested system in the CF inventory and that there is no single analysis, at a particular point in time, that could conclude that the software is categorically safe. In this regard, they cite the OAG's conclusions relative to an audit of the Canadian Automated Air Traffic Control System project.)* The PMO comments will be discussed with the responsible OAG Principal to determine the advantage of follow-on review work outside of the scope of this current review.

Warranty (Concerns No. 21, 30, 35, 36, 37, 38, 41, 42, 43)

14.1.11 Nine specific concerns focused on the adequacy of warranty provisions in the prime contract. There was sufficient evidence to refute these concerns. In many instances, the expressed concerns do not accurately depict the complexities of the warranty provisions or reflect an understanding of the contract and its evolution through to the OAA. Technically speaking, the contract includes the provisions relative to warranty and insurance that are necessary to ensure that the Crown is well protected. In addition, while concessions were made during the OAA negotiations whereby the Crown accepted additional liability in the area of warranty and insurance, this was mitigated by the waiver of claims against the Crown granted by the contractor and by the resolution of outstanding technical issues. Although all 12 CPFs were accepted by the Crown as of July 1996, the warranty cap of $21.5M has not been exceeded.

Spares (Concerns No 18, 22, 44)

14.1.12 The three concerns raised with respect to spares, cite questionable pricing, inadequate quantities, and possible irregularities in the contracting process. Based on the information provided, it was assumed that the concerns related to spares procured for SRP 1. We concluded that there is no basis to any of the concerns related to spares. Consistent with the TSIR contracting strategy, SRP 1 spares were procured through the prime contractor. While higher prices may have been paid in some instances due to additional tiers of overhead and profit, this contributed to the reduction of technical risks associated with design changes. Our review has determined that there were no sparing shortfalls. In fact, we have expressed some concern regarding the apparently slow usage rate of spares. A detailed examination of a number of the CPF PMO initial provisioning procurement files did not identify any systemic irregularities in the contracting process. Additional details are provided in section 10.

14.13 The conclusions reached for each of the specific concerns relating to contract management have been categorized as follows:

a. Merit. There is sufficient evidence to substantiate the concern.

b. Some Merit. There is sufficient evidence to substantiate a concern at a point in time. However, management action was taken to rectify the situation.

c. No Merit. There is sufficient information to conclude that the concern is not founded. Or, there is insufficient evidence to substantiate the concern.

Interdepartmental Review of the Canadian Patrol Frigate Project: Detailed Analysis of Specific Concerns - CPF Project/Contract Management

Concern No. 1 — Delivery of CPF Technical Documentation

A subcontractor (name removed) has been paid for delivery of 100 per cent of the frigate technical documentation but has only delivered 40 per cent.

Conclusion and Supporting Discussion

No merit. The review established that by August 1995 the subcontractor had not been paid for delivery of 100 per cent of the documentation, for which there was a total budget of $77M. This is because not all of the technical documentation had been received, as contract conditions stipulate that final deliverables were not due until September 1997. However, a large portion of documentation was in draft form and the subcontractor was paid for 100 per cent of the costs incurred, in accordance with the terms of the contract. Furthermore, we noted that the Project Management Office (PMO) had processes in place to ensure the visibility of the technical documentation received. In addition, processes existed to ensure that where technical documentation was not delivered, milestone payments were reduced.

Concern No. 2 — Delivery of Vendor Data Packages

The same subcontractor (name removed) was paid $600M for system integration but no deliverables were ever received because the subcontractor did not buy data packages from the vendors.

Conclusion and Supporting Discussion

No merit. In fact, the source of this concern subsequently acknowledged that the cost of system integration was much less than $600M. The individual also alleged that substandard deliverables were received rather than no deliverables, as previously noted. Our review determined that combat systems have been integrated by the subcontractor at a total cost of approximately $148M, not $600M.

With regard to the statement on the absence of deliverables, this was true only in the early stages of the project. The task of weapon, sensor and marine systems integration was complex, and a number of delays in software design were experienced. We did find evidence to suggest that in 1990 there were delays in the procurement of vendor software and that this was addressed in the software work-around plan. The 1993/94 Overall Amending Agreement (OAA) negotiations indicated that vendor software was procured but that the certification of some of the modules was an issue. We were informed by Program Generation Centre (PGC) staff that they now have the data packages necessary to maintain the CPF software. Ship crews and the fleet school informed the review team that the integration of the combat and marine systems was satisfactory.

Concern No. 3 — Payment for a Deficient Weapon System

A vice president (name removed) of the subcontractor (name removed), is alleged to have confided to (name removed) that a particular defence contractor (name removed) received a payment of $46M for a weapon system (not related to the MPT) that had many problems.

Conclusion and Supporting Discussion

No merit. There were no CPF payments made to the particular defence contractor, nor were there CPF contracts with this contractor for a weapon system valued at $46M. The only CPF contract with the named contractor was for the development of a sonar reading data base system — in the amount of $12M — that was cost shared equally with the Canadian Towed Array Sonar (CANTASS) Project. A review of all DND payments made to the named defence contractor from 1989 to 1993 — the period that the named vice president was employed with the named defence contractor — will be pursued separately from the CPF Review.

Concern No. 4 — Hazardous Defective Radar

Defective radar on the ships makes it dangerous for the crews, as this equipment is emitting a higher level of radiation than that which is acceptable in the workplace.

Conclusion and Supporting Discussion

No merit. There is insufficient evidence to substantiate the concern that radar systems on the

CPF are defective. It is a known fact that the technology used in radar poses certain risks because it does emit radio frequency radiation. These risks are well understood and managed through procedures that govern how and when radar should be used. The procedures were developed through extensive radiation hazard surveys conducted during CPF trials prior to deployment.

With respect to recent media reports on health problems related to Navy technicians maintaining the fire control radar, it is the view of DND that standard safety procedures are in place to prevent harm to personnel. The CPF fire control radar is in service on frigates from five European navies.

Concern No. 5 — Replacement of Outdated Computers

The first computers provided by the subcontractor (name removed) were York 406s that were outdated and had to be replaced.

Conclusion and Supporting Discussion

No merit. York 406 computers were not included in the CPF contract deliverables. CPF PMO staff and procurement staff of the named subcontractor were not aware of these computers, nor could we find evidence in the CPF project that they existed. We did observe that other outdated computers were justifiably replaced on the first six ships.

Concern No. 6 — Delivery of Software Documentation

Contracts were loosely written which enabled the subcontractor (name removed) to bill for delivery of data documents but no data was provided, only a statement "to be determined".

Conclusion and Supporting Discussion

Some merit. At one point in time, data documents were received that contained statements such as "to be determined". However, as these were draft documents, this did not have any adverse impact on the overall project. In these cases, milestone payments were withheld until the documents were finalized. For more information, see comments in Concern No 1.

There are thousands of pages of contracts associated with the CPF program — the prime contract alone includes 40,000 pages. We did observe a high degree of specificity in the contract

documentation that we reviewed. For example, the contract schedules included Data Item Descriptions (DIDs) that detailed the contents of all deliverable data documents. These deliverables were rigorously scrutinized by CPF PMO prior to their final acceptance.

Concern No. 7 — Impact of Lost Data Documents on Integrated Logistic Support

Data documents lost during the subcontractor's (name removed) move to the U.S. will prevent DND from completing the proper Integrated Logistic Support (ILS) program.

Conclusion and Supporting Discussion

No merit. The concern that documents were lost during the said move is refuted in Annex A of the *Interdepartmental Review of the CPF Security*. However, with regard to the ability to perform proper ILS, Program Generation Staff (PGC) staff have indicated that they have the technical data packages necessary for the maintenance of the in-service life of the CPF software. Our review of the PGC library holdings indicates that the required design documentation has been delivered.

Concern No. 8 — Deficient Integrated Control System

The integrated control system does not work properly if all systems are activated at the same time. The system will work only when a limited number of systems are activated. For example, during the demonstration of vessels to a Saudi Arabian delegation, the sonar showed two vessels on surface when only one vessel existed.

Conclusion and Supporting Discussion

No merit. We were not able to establish a basis for stating that the activation of all systems would result in the system not working properly, because such a test has never been carried out. However, systems were successfully tested individually in the trials process and collectively by simulation. For reasons of cost and practicality, the decision was made not to operationally test all systems simultaneously.

The example of a deficiency affecting a sonar was essentially true; however, this fact does not support the concern that the integrated control system does not work if all systems are activated. The deficiency in the 505 sonar was recognized, and it is in the process of being resolved by replacing the 505 with the improved 510 version. The 510 version provides enhanced resolution in the passive mode to distinguish dual signals from a single target.

Concern No. 9 — Circumvented Software Development Process

The following attachments are but 11 of thousands that relate to contractual processes that have been circumvented, in whole or part. On one assignment (so as to aid and instruct DND personnel on how to manage from a technical, financial and contractual perspective), I identified 1700 contractual references related to CPF Systems/Software Development Processes. These process steps were not options to be arbitrarily followed by DND, DSS and/or industry. The CPF budget of $277M for the Contractor's Program management alone certainly provides the financial resources to at least complete the contractual adherence to process by industry.

Conclusion and Supporting Discussion

Some merit. Some aspects of software development were not performed at a given point in time. However, management action was taken to modify the development process in order to overcome the delays experienced due to the complexities of combat and marine systems integration.

Software development did not proceed as planned, and changes were required to address difficulties that were encountered. Non-conformity with the software development process was identified by the Mitre Corporation, an independent US non-profit agency contracted by the CPF PMO in 1989 to assist in resolving the situation. However, Mitre also noted that the CPF PMO had taken appropriate corrective action, although positive guidance to the contractor could have been provided earlier. The phased software development approach recommended by the external consultants — rather than the delivery of the complete software prior to provisional acceptance of the lead ship — permitted the completion of the CPF software integration and was instrumental in the project getting back on schedule. The change in the software development approach was reflected in contract amendments. Analyses of contractual processes that were alleged to have been circumvented follow in Concerns No. 10 through 15.

Concern No. 10 — Contract Price Escalation

The CPF contract, Schedule C (Red Book), as issued in 1992/93 shows that $6.4B was the total outlay for this fixed price contract. By contract, the Functional Specifications were to have been

frozen by 1986. In fact, the functionality of both the Combat and Marine Systems have been downsized, which should have lowered the contract price. In reality, it had the reverse effect. The current quoted completion price for CPF is now $9.4B. The difference of $3B in what can best be described as "recent contract creep" within the last two years is of considerable concern.

Conclusion and Supporting Discussion

No merit. The difference between $6.4B and $9.4B cannot be attributed to contract price creep. The CPF prime contract value may have been confused with the total project budget.

It is apparent that some technical functionality was modified; however, these modifications did not result in a $3B increase to CPF program costs. Changes to contract price as a result of modifying functionality were managed through Contract Change Proposals (CCPs) and the OAA.

Concern No. 11 — Cost Schedule Control System not Delivered

Contract Performance: As a start, the integrated CPF Cost Schedule Control System (CSCS) does not exist. A major non-compliance issue. Why was this allowed by the contracting authority, DSS?

Conclusion and Supporting Discussion

Merit. Initially, there were significant difficulties encountered in implementing CSCS, and the prime contractor was placed in breach of contract.

However, the impact was minimized through the use of alternate reporting systems. CSCS was eventually implemented and has been used, **although not in isolation**, to monitor project performance since 1989. It was certified in 1993/94.

Concern No. 12 — Delivery of Software Documentation

Total System Integration: Acquisition of required documentation is less than 15 per cent of stated requirements per system/software classification and Data Item Description (DIDs). An exposure to the Canadian taxpayer of many hundreds of millions of mostly US dollars. Non-compliance.

Conclusion and Supporting Discussion

No merit. This concern appears to relate to documentation that was allegedly not received but for which payments were made. Concern No. 1 refers.

Concern No. 13 — Integrated Marine Control System Specification Deliverable

Contract Documents: The Marine Systems Specification (CDRL 2000) was rejected in 1986 and it effectively does not exist. Please have your staff check additional cost(s) and contract downsizing approved by government representatives after 16 MAC (months after contract). Non-compliance.

Conclusion and Supporting Discussion

Some merit. However, action was taken by management to correct the deficiencies associated with CDRL 2000. We noted that CDRL 2000, an update to the Integrated Marine Control System (IMCS) contract specification, was submitted by the prime contractor but was found to be deficient by the CPF PMO. The changes that were required to the IMCS were subsequently addressed by four contract amendments to incorporate technologically feasible specifications. Increases to costs were due to software development difficulties and not to specification changes.

Concern No. 14 — Contract Change Proposal Cost and Schedule Impact

Prime Contractor Configuration Control: Financial estimates (if they were submitted and approved) should be reviewed and totalled. The implications concerning CPF schedule and cost increases will prove incongruous.

Conclusion and Supporting Discussion

No merit. The concern as expressed is not clear. It was assumed that there was a concern that financial estimates for CCPs were not submitted by the contractor or reviewed by the CPF PMO. However, there is insufficient evidence to substantiate the stated concern as interpreted.

In a review of a sample of six CCPs, we observed that the process was in accordance with the terms of the contract. Financial estimates were submitted by the prime contractor and reviewed

in detail by the Crown prior to approval. The review also indicated that the CPF PMO had evaluated the impact of the CCPs on the schedule.

Concern No. 15 — Evaluation of Contract Change Proposal Impact

Impact Evaluation: Auditing of paragraph F and H evaluation will be beyond comprehension. Non-compliance.

Conclusion and Supporting Discussion

No merit. The concern as expressed is not clear. It was assumed that it is suggesting that it was difficult to understand and impossible to implement paragraphs F and H of the contract's Configuration Management Plan. If this is the case, we did not find sufficient evidence to substantiate this interpretation of the concern.

Paragraphs F and H address criteria for evaluating CCPs. During our review, we observed that the CPF PMO followed a process to evaluate the impact on cost and performance for proposed configuration changes. A detailed analysis of a sample of six CCPs confirmed that an appropriate evaluation was performed. A concern raised with respect to potential descoping in CCPs is addressed in Concern No. 33.

Concern No. 16 — Provisional Acceptance Software Design Divergences

The Provisional Acceptance and Amending Agreement (PAAA) of 1991, as agreed to by the Canadian Government, was another interrelated bit of philanthropy that lowered the requirements of Industry while off-loading downstream penalties to the taxpayer and Naval staff. See article D.2 (Software) as stripped out of the CPF Contract by the PAAA (Provisional Acceptance Amending Agreement).

Conclusion and Supporting Discussion

No merit. The PAAA enabled the contractor to deliver a partially completed lead ship and allowed the shipboard testing of the completed work to begin. However, this did not relieve the contractor of the responsibility for delivery of an integrated weapon system.

Article D.2 was to ensure that the software divergences on the lead ship were resolved before acceptance of the second ship. There were adequate safeguards in other articles of the prime

contract and in the respective acceptance procedures to ensure that software defects would be captured and addressed. In this regard, both the first and the second ship received final acceptance in late 1992, maximum penalties for late delivery were imposed, and the contractor was obligated to address recorded software deficiencies.

Concern No. 17 — Quality Assurance Procedures

Warranty: Explicit for the casual reader. However, operationally critical and a very expensive agenda items related to logic and firmware component replacement, the associated QA procedures and responsibility, i.e., PROM modification and CM, etc, Engineering policy, etc were continually circumvented starting in 1988. Your staff can use SPS 49 Radar component pilot test in Esquimalt as a baseline to determine if the CPF can function and if the contractual life cycle of 25 years presents the Canadian Taxpayer with never ending unbudgetable pain.

Conclusion and Supporting Discussion

No merit. We observed that quality assurance (QA) processes were refined over the life of the project, as evidenced by the fact that the number of deficiencies diminished significantly with each subsequent ship. We did not find evidence to suggest that QA processes were continually circumvented. It was concluded in Concern No. 38 of this Annex that design warranty for the combat system integration had expired by the time testing had been completed and the CPF software finally accepted.

With regard to the SPS 49 radar, both operational usage and the amount of corrective maintenance it requires do not indicate that the system is other than reliable. The logistic support for the combat systems has been well developed with a minor potential surplus of some spare parts.

Concern No. 18 — Shortfall of Command and Control System Spares

Warranty: In addition, the procurement of low volume, exorbitant cost solid state replacement spares for 131 sub-systems of CCS (Command and Control Systems) has created a major naval operations problem no one wants to address. Were these functions bypassed by contract administration or left out so as to low ball the real CPF program cost? Identify and negotiate with the RFSS (Radio Frequency Simulator Stimulator) vendor for modified logic spares as a test case.

Conclusion and Supporting Discussion

No merit. During the review of Command and Control Systems (CCS) spares, we could not find evidence to support that shortages of these spares had created operational difficulties. Treasury Board directed that life-cycle initial provisioning would be included in the CPF project to avoid a repetition of the significant spares shortfalls experienced in the CF 18 procurement. We noted that the Immediate Operational Requirement process was not used to procure CCS spares, indicating that there was no shortfall of these spares. In addition, during initial provisioning, the volume of the CCS spares procured had to satisfy a 95 per cent availability factor, while other spares were limited to 85 per cent availability. This would suggest that CCS spares were not under-procured to "low ball" program costs.

With regard to the Radio Frequency Simulator Stimulator (RFSS) used in the combat system training centre (CSTC), additional spares were in the process (at the time of our review) of being procured because of delays in the acquisition of the combat system trainer (CST). However, no operational difficulties have resulted from this situation.

In light of the exhaustive warranty provisions of the CPF contract (both current and pre-OAA) and the extensive tracking of warranty items, it was concluded that there is no substance to the concern that contract administration functions were bypassed to "low ball" the real CPF Program cost. Pre-OAA, 80 per cent of the cost of remedying defects covered by warranty was accounted for within the contract price; the remaining 20 per cent was accounted for outside the contract price but within the project budget. With the advent of the OAA, 100 per cent of warranty costs are to be covered within the firm price, up to a limitation of $18M (now $21.5M). The cost of replacing any solid state components found to be defective subsequent to warranty expiration would not be accounted for in the CPF Program budget.

Concern No. 19 – Delivery of Software Design Documents

Warranty: Investigate the Software Requirement Document (SRD) Specifications and Software Design Documents (SDD) and premature and incomplete Purchase Orders prepared for Systems and Software procurement.

Conclusion and Supporting Discussion

Some merit. The meaning of this concern is unclear. Although it was made in the context of the warranty provisions of the contract, no additional context was provided. As such, we assumed that the concern relates to the Combat System Software (CSS) documentation and to the difficulties encountered in establishing the integration and in-service baselines for the CSS. We also assumed that the concern is questioning how the Crown could enforce the warranty provisions in the event that any defects were found subsequent to final acceptance, if finalized software specifications never existed in the first place. In this regard, there is sufficient information to substantiate the concern; however, corrective action was taken by management. This was a complex developmental project and, as discussed in Concern No. 9, there was a considerable delay in fixing the software requirements and subsequent design documents. We have reviewed the Software Requirement Document (SRD) and Specifications and Software Design Documents (SDDs) documentation and have noted that the draft documentation has been received. Although software design was not finalized on schedule, integration proceeded subject to a rigorous trial agenda and testing regime. Final software documentation deliverables were not due until September 1997.

With respect to the contractual implications of this concern, the prime contractor was obliged to correct any software deficiencies identified up to the time of final acceptance of the software – in other words, until the in-service baseline was established. Warranty would not come into effect until after final acceptance. While there may be some basis to the concern that a subcontractor, as the combat system integrator, raised internal purchase orders before software requirements were fully defined, the appropriateness of the timing of any such purchase orders is not relevant in light of the acceptance procedures in the contract.

Concern No. 20 – Detailed Software Specifications

Warranty: How does the Canadian Federal Government know what it bought if architectural and detail specifications do not exist? Note the financial responsibilities for CPF design and integration defects. Does ADDAM exist?

Conclusion and Supporting Discussion

No merit. The terms and conditions of the prime contract placed the responsibility for total system integration, including detailed specifications, on the prime contractor. A rigorous QA, trials and evaluation process assured the Crown that this was achieved.

Our review confirmed that architectural and detail specifications do exist, although there were significant delays in finalizing the software documentation. Preliminary specifications were included in the request for proposal, with the understanding that the contractor would complete the SRD and SDD for the combat and marine systems integration. Although software design documentation was behind schedule, the testing regime ensured systems integration.

Regarding financial responsibility, software deficiencies noted at the time of acceptance and baselined in June 1995 supersede the warranty and must be rectified by the contractor within the fixed-price agreement.

We noted that the Analytic Discrete Event Distributed Architecture Model (ADDAM) does exist and was used in combat system integration design.

Concern No. 21 – Warranty Expenditures

Warranty: Investigate the Deliverable End Item acceptance against the warranty expenditures ledger dates and times.

Conclusion and Supporting Discussion

No merit. Our tests indicated that deficiencies were identified during end item delivery acceptance and that warranty claims were made after the end item acceptance dates.

The contractor remained responsible for resolving the deficiencies recorded at the time of acceptance. Costs to resolve deficiencies pre-OAA were the responsibility of the Crown with subsequent profit penalties to the contractor; post-OAA costs were the responsibility of the contractor. With respect to warranties, we observed that the CPF PMO has a process in place to monitor the costs of post-acceptance defects and to track the resolution of warranty items.

Concern No 22 – Spares Pricing and Specification

Warranty: Investigate the spares (hardware and firmware) ECO levels and DBIDD (Data Bus Interface Design Document) specifications and dates and rationale for any industry charges.

Conclusion and Supporting Discussion

Some merit. The concern as expressed is not clear. It could mean that the spares were over-priced and did not comply with specifications. Although higher prices were paid for some spares, the management strategy of procuring spares through the prime contractor — to reduce technical risk until the design was fixed — was not unreasonable.

A decision was made to procure the spares from the original equipment manufacturers (OEMs), as there was a perceived technical risk associated with procuring them elsewhere. This may have contributed to higher prices; however, the technical risks of purchasing from another supplier were perceived to outweigh potential cost savings. The spares were procured from the OEM; therefore, the same subsystem Data Bus Interface Design Document (DBIDD) specification was applicable to the subsystem spares.

Concern No. 23 – Certification and Integration Testing

Warranty: Investigate the costs for the never ending rounds of Certification and Integration testing and incremental costs (unplanned industry income) for Category I, II and III Sea Trials.

Conclusion and Supporting Discussion

No merit. The CPF was a significant, complex undertaking that required a rigorous testing regime. During the course of the project, some cost-prohibitive trials were cancelled and other trials were streamlined as observed defects declined and confidence in the product increased. For example, the July 1994 OAA cancelled the requirement to groom all combat systems in the land test facility before their installation on the last six ships. In addition, while over 200 ship sea trials were required to test the first two CPFs, the number was reduced to 31 trials per ship for the last three CPFs. It is important to note that this concern contradicts Concern No. 8.

Concern No. 24 – Combat System Test and Support Facility

Warranty: The CSTSF was never utilized as required for numerous and questionable reasons which included land based for full load testing before contractually starting ship integration testing and/or Sea Trials.

Conclusion and Supporting Discussion

Some merit. The Combat System Test and Support Facility (CSTSF) was not utilized, as was originally intended. However, alternate testing means were used by management to get the project back on schedule, and corrective action was taken by management.

Not all of the 117 trials planned for the CSTSF were completed prior to sea trials, due to slippage in the overall software development schedule. However, bypassing some of the CSTSF trials, which reduced contractor costs, was raised as an issue by the Crown during OAA negotiations. The fact that not all CSTSF trials were done did not adversely affect the project, as the required trials were conducted at the CSTC and during the shipboard integration trials.

Concern No. 25 – Configuration Control of Software Specification Revisions

Warranty: Investigate the revisions to the many thousands of software and hardware design, test and life cycle support specifications (CDRLs) and their individual status relative to each of the Commissioned CPF Ships. Check the Configuration Management processes and CM Information Systems that were required to be in place by 6 months.

Conclusion and Supporting Discussion

Some merit. There were numerous software and hardware design revisions. However, these revisions were necessary to resolve system integration difficulties experienced in the early years of the project. To investigate the thousands of revisions mentioned in the assertion would not be cost effective. We did observe that there were numerous revisions to software and hardware design that were addressed as per contract conditions. The need for revisions was confirmed by outside experts, hired by the CPF PMO, who assisted in resolving some of the difficulties that the project was experiencing. The revisions were managed through an active configuration management (CM) process in the CPF PMO.

As required, the CM plan was delivered six months after contract. The CM process required regular reports from the contractor on hardware and software configuration for each ship. CM changes were subject to approval by the CPF PMO and were tracked by the CPF PMO

Configuration Management Information System (CMIS). Furthermore, a separate milestone for outstanding functional and physical configuration audits was incorporated into the July 1994 OAA.

Concern No. 26 – Vendor Design and Test Documentation Deliverables

Warranty: Re task #2 of Combat System Work Around Planning Group of 1990, design test and documentation provided by the subcontractor (name removed) was found to be of little, if any value. It was obvious that the data provided was not contractual and the budget for life cycle support would then provide for the ongoing, nearly infinite source of cash for certain vested interests. Check tactics used vs the CF 18 Program.

Conclusion and Supporting Discussion

No merit. The Crown recognized that there were deficiencies in the design and test documentation provided by the subcontractor. Due to the complexity of integrating numerous weapon and sensor systems, it was expected that there would be some software design deficiencies. Using the Work-Around Plan as a baseline, CPF PMO staff, in conjunction with independent external consultants, identified design test and documentation deficiencies; however, this did not prevent the integration from proceeding. All outstanding deficiencies are being tracked and must be rectified by the contractor prior to the last milestone payment in the OAA. The OAA also identifies the qualification and proof-testing documentation that the contractor is obligated to provide for six CPF subsystems. In the case of the CF 18, the in-service support is provided by a software engineer squadron at CFB Cold Lake. Similar life-cycle support is provided by the PGC in Halifax.

Concern No. 27 – 72-Hour Full Endurance Test Deficiencies

Warranty: Investigate the CPF Systems and Software problems identified in a 72-hour test held at the subcontractor (name removed) and determine if the hundreds of problems have been remedied en tot per CPF Contract. An investigation is warranted to determine whether the Canadian taxpayer has been paying for work per paragraph B.1 or was the expenditure used to top off the warranty cap so as to proceed in time and materials? A loose, loose situation for the Naval staff as well as the vast majority of Canadians.

Conclusion and Supporting Discussion

No merit. The 72-hour test, although delayed, was carried out in October 1992. The problems identified during the test were not items covered under the provisions of the warranty. Corrective action was the responsibility of the contractor and the associated costs were reimbursed by the Crown as per contract conditions. It is recognized that the design problems noted in the 72-hour test had to be resolved in a relatively short time, as the design warranty expired in December 1993. However, the system problem reports (SPRs) generated by the testing regime thoroughly documented the design deficiencies. These reports were addressed in the July 1994 OAA as two separate milestones.

Concern No. 28 – Resolution of Design Review Action Items

Warranty: Investigate the minutes of the CPF Combat System Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR) and validate contract compliance. There were approximately 3500 Action Items at the end of the CCS proforma reviews not counting the CPF Communications subsystems. What is their status? Did 3000 AIs disappear at the CCS CDR in 1989?

Conclusion and Supporting Discussion

No merit. Although delays were experienced in the preparation of design documentation prior to some design reviews, Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs) were conducted. The Action Item (AI) database used to track PDR and CDR issues has been in use by the CPF PMO since 1987. Our review of the AI data base, a manual AI log, minutes of PDRs and CDRs, and correspondence with the prime contractor could not find evidence to support the claim that 3,000 AIs have disappeared. All outstanding AIs were resolved during the OAA negotiation process.

Concern No 29. – Documentation Deliverables

Warranty: Also, and in the interim please have your staff check on the latest CPF documentation audit by CPF and Maritime Command. 10 per cent may be reaffirmed figure dating back to 1989.

Conclusion and Supporting Discussion

No merit. This concern is not clear. It assumes that the documentation situation that prevailed in 1989 still persists. As in Concerns No. 1 and 12, there is sufficient information to conclude that the concern is unfounded. A substantial number of documents have been received in draft, although final deliverables are not due until September 1997. The CPF PMO has an automated process to track the delivery of technical documentation.

Concern No. 30 – Warranty

Adequacy of Warranty Provisions

Conclusion and Supporting Discussion

No merit. The contract contains the necessary warranty provisions to ensure that the Crown is adequately protected. Although the contractor's liability is limited in the area of warranty, it is concluded that this arrangement was necessary so that risk could be shared equitably between the Crown and the contractor. The Total System Integration responsibility assumed by the contractor, and the extent of design and development required – coupled with the fact that a warship of this kind had not been built before in Canada – translated into high risk for the contractor. With regard to the dollar limitations established for liability, these are not inconsistent with the contingencies normally included in a selling price to cover potential warranty claims, nor are they inconsistent with the percentages held back by PWGSC in firm-price shipbuilding contracts until warranties have expired.

With regard to the OAA, the Crown did assume additional liability in the area of warranty and insurance, although such liability was offset by the waiver of claims against the Crown granted by the contractor and by the resolution of outstanding technical issues. In addition, the new cap on the contractor's liability, established as part of the OAA and approved by Treasury Board (TB), was a reasonable forecast of potential warranty claims based on actual warranty claims to that date. To date, the warranty cap has not been reached.

Concern No. 31 – Not Managing Contract In Accordance With The Contract

One of my projects was to reduce the 36,000 page CPF Implementation Contract to its salient points by Order of Precedent, etc, so that DND/DSS could manage per fiduciary requirement. Unfortunately, this approach was not followed by the vast majority of government employees as it was much easier to create ones own interpretation of the way ahead and much easier for retired government staff in private industry to comply.

Conclusion and Supporting Discussion

No merit. Given the lack of definitive information provided by the complainant, the assumption was made that this concern refers to the problems encountered with the development of the Combat System Software (CSS) which resulted in the development of the Memorandum of Understanding (MOU) between the Crown and the prime contractor, dated 12 August 1988.

The MOU did not relieve the contractor of its obligation to develop the software; it allowed the contractor to take a different approach to software development. This enabled the contractor to complete the software critical to acceptance of the lead ship for trials and, at the same time, to continue to work on the CSS. Essentially, the MOU could be construed as granting a waiver. The MOU stated that the Crown would continue to hold the prime contractor in breach of contract until such time as the contractor submitted a plan describing how it would meet its software obligations along with a CCP reflecting the undertakings agreed to in the MOU. As intended, the contract was subsequently amended to incorporate the MOU undertakings. In summary, the MOU constituted a "way ahead" to enable the contractor to continue with the development of the CSS, and it was not considered to represent a formal contract amendment. In the case of a dispute, the contract would take precedence over the MOU.

Concern No. 32 – No Contractual Requirement for Design to Cost

Design to cost management: I do not recall the contractual requirement being in place. Perhaps your staff can find it and evaluate it's contractual compliance to the ISOW.

Conclusion and Supporting Discussion

Some merit. A "design to cost" contract gives the contractor a budget and asks for a design to be developed within that budget; therefore, the design is constrained by cost. In the case of the CPF project, the Implementation Contract was based on the general design to cost proposal submitted by the contractor and finalized during negotiations with the Crown as part of the Contract Definition phase of the project, which preceded the Implementation Contract. As such, it is correct to state that there was no contractual requirement for design to cost in the Implementation Contract since the Crown had already agreed upon a general design in the Contract Definition phase. In accordance with the terms of the Implementation Contract, the prime contractor was

responsible for completing the detailed design and engineering within the ceiling price and, subsequently, within the firm price. While there is sufficient information to substantiate this concern, there was no adverse impact on the project.

Concern No. 33 – Performance Downsizing

The Auditors should audit the hundreds of CCFs and CCPs relating to the CPF development/test processes and performance downsizing. Non-compliance.

Conclusion and Supporting Discussion

No merit. Based on our review of the contract, our analysis of the CPF PMO procedures for processing Change Control Forms (CCFs) and CCPs, and an examination of a sampling of CCPs, there is sufficient information to conclude that the concern is not founded. Changes are subject to a rigorous process designed to ensure that the integrity of the configuration control process is not compromised. Our review of a random sample of CCPs indicated that the CPF PMO rigidly followed the prescribed process and obtained the requisite approvals. In addition, we could not find any evidence to substantiate the concern that any performance downsizing was inappropriately handled. The cost and impact evaluation of CCPs is addressed in Concern No. 15 of this Annex.

Concern No. 34 – Contractual Obligations

Letters, memorandum and verbal agreements between government representatives and industry do not supersede contractual obligations.

Conclusion and Supporting Discussion

No merit. This statement is a matter of fact, although the intent of or context for this statement is unclear. A contract sets out the parties' respective rights and obligations — in essence, the terms of the contract. In the case of the CPF, the contract set out a specific amendment formula to deal with modifications to those rights and obligations. Correspondence — whether written or verbal — can best be categorized as documents interpreting the contract, and not as amendments to the contract itself. As long as such documents do not purport to be contract amendments, they are acceptable and often facilitate the progress of the work.

There is insufficient evidence to substantiate the interpretation of this concern. Our review of a sampling of correspondence concluded that, when required to do so, the CPF PMO actively enforced the terms of the contract. Relative to contractual obligations, correspondence in the form of letters, for example, was used primarily to clarify the contract, to advise the contractor that it was in breach of contract, or to provide a "way ahead" when difficulties were being encountered. It should be noted that it would not be unusual in a contract of the CPF's magnitude for the Crown not to exercise all its rights and remedies under the contract. In that regard, the administration of contracts should reflect flexibility and judgement.

Concern No. 35 – Adequacy of Warranty

A predominant topic for those at the product acceptance/payment approval level during the last 10 years has been 'the CPF Warranty situation' which established a minimal sum of $64,000,000 on which industry could draw upon. This sum was later reduced to $18,000,000 which was also for the entire life of the CPF Implementation Contract. This effectively created a capped warranty (a maximum financial exposure for Industry) which was approved by the Federal Government in Ottawa.

Conclusion and Supporting Discussion

Some merit. While it is correct to state that the contractor's financial exposure was capped relative to warranty, the figure of $64M is not correct. Until the OAA in 1994, the contractor's liability was capped at $80M; the $18M cap referred to in the concern was negotiated as part of the OAA. It is misleading to imply that this reduction effectively capped the maximum financial exposure for industry when, in fact, the contractor's liability had been capped from the outset of the contract. It should also be noted that the $18M cap is on only materials/workmanship and total system integration, as the design and performance warranties had essentially expired as of the OAA. This cap was subsequently increased to $21.5M.

At the time the OAA was being negotiated, seven of 12 ships had been delivered, two more were expected to be delivered within several months, many of the technical problems had been resolved, and a subcontract for three ships had essentially been completed. Moreover, actual warranty claims up to the OAA were such that establishing an $18M limitation would not be unrealistic and would represent the worst case scenario in terms of potential warranty costs. PMO/CPF did not consider $18M to be an unrealistic amount or to represent an unreasonable risk. The new cap was established as part of the overall negotiations to conclude the OAA. All ships were delivered as of July 1996 and, to date, the warranty cap has not been exceeded.

Concern No. 36 – Adequacy of Warranty

A capped financial exposure of "1/5" of 1% of total CPF program price" is too low for an industry that "may" be producing deficient capability.

Conclusion and Supporting Discussion

No merit. Assuming that this concern is referring to the total value of the prime contract at the OAA, the percentage referred to is inaccurate. One-fifth of one per cent is actually $13.4M, whereas the actual limitation on warranty at OAA was $18M. As indicated in Concern No. 35, the warranty cap has not been exceeded to date.

Concern No. 37 – Payments above Contract Price

Once warranty monies were spent, any subsequent expenditures to make the CPF Class of ships meet contractual standard were then to be paid on a time and materials basis above the fixed price. Perhaps this explains the recent 'three thousand million dollar payout' above the documented fixed price contract of $6,400,000,000 as published in 1992/93 for 12 ships and the debatable land facilities.

Conclusion and Supporting Discussion

No merit. This concern is unclear as stated. We assumed there is a concern that the prime contract price would increase to include the cost of warranty work if the warranty cap was exceeded. On that basis, there is sufficient evidence to conclude that this concern is not founded. Until the OAA, the prime contractor was reimbursed its actual costs to remedy a defect without allowance for profit. Dollar limits were established on the materials and workmanship, design, performance and the total system integration, which capped the contractor's liability in these areas. If any of the limitations were reached, this would cause the warranty period to expire if the time limitation had not already expired. The cost of any work required to correct deficiencies subsequent to expiration of warranty would be paid outside the CPF contract. Although the OAA firmed up the contract price, the contractor's liabilities in the area of warranty continues to be capped. The cost of any warranty work will now be covered within the firm price, up to the cap. Should the warranty expire, the cost to remedy a defect would be outside the scope of the contract.

With respect to the latter part of this concern, it is not clear what is meant by a "three thousand million dollar payout above the documented fixed price contract" to "make the CPF class of ships meet contractual standard". With the delivery of the twelfth and final ship in July 1996, warranty claims had not reached the limitation. As indicated in Concern No. 10 in this Annex, there may be some confusion between the prime contract price and the total cost of the CPF Project.

Concern No. 38 — Lack of Warranty Protection

*Obviously, this is not warranty protection for the Canadian taxpayer at all but a charade. In 1995, a Commodore in the Canadian Navy stated the Liberal Government had not accepted the CPF Software (The Ships and the CSTC, MMF, etc)***.**

Conclusion and Supporting Discussion

Merit. The context for this concern is unclear. Based on other related concerns, it has been assumed that this concern is referring to the integration of CSS. On this basis, there is sufficient evidence to substantiate this concern, although there was little or no adverse impact on the project as a result.

The warranty provisions ultimately did not cover the CSS, since warranty does not come into effect until final acceptance. In the case of the CSS, the subsystems were not fully certified and integrated (i.e., the Integration Baseline) until December 1994, and final acceptance (i.e., the In-Service Baseline) did not occur until September 1995. By that time, the design and performance warranty on the lead ship had already expired, so, essentially, the design and performance of the CSS was never warranted. Nevertheless, the contractor was obligated by the contract to correct any deficiencies in the software before final acceptance could be granted. Our sampling of the trials and evaluations witnessed by the Crown, as well as our interviews with ship crews indicated that the software deficiencies were resolved by the time of final acceptance, (September 1995). QA procedures are also addressed in Concern No. 17 in this Annex.

Concern No. 39 — MOU not Contractual

The MOU relating to software design and testing sequencing is not contractual per the last paragraph. Why was it signed by DSS/DND and allowed to be managed to by and for industry?

Conclusion and Supporting Discussion

No merit - as discussed in Concern No. 31. As a result of problems encountered in the integration of the CSS, the contractor and the Crown agreed that a different approach to software development was required. Both parties agreed that the contract was a major impediment to progress, as it required the contractor to successfully complete the work of one development phase prior to proceeding to the next phase, as well as to complete the reviews of the Software Design Phase prior to conducting System Critical Design Reviews. Because the contract presupposed a linear approach to software development, the problems ultimately encountered could not be managed within the framework of the contract as it was written at that time. This situation was exacerbated by the Total System Integration Responsibility (TSIR) nature of the contract, which hampered the Crown's ability to intervene in matters between the prime contractor and its primary subcontractor.

To mitigate these difficulties, the parties entered into an MOU, which articulated the way ahead – this was not a contract amendment. Specifically, it allowed for a concurrent approach to software development as opposed to a linear approach. Until such time as the contractor submitted a CCP, and the Crown approved it and amended the contract, the Crown continued to hold the contractor in breach of contract

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Concern No. 40 — Combat System Work Around Plan

Among just one area of operational and financial exposure have your staff look for the compliance to DID 898 and ME003 for all firmware with the CPF Program. There is very little. Note: This is Task #2 of the CPF Combat System Work Around Planning Group of 1990 and to which I was the Chairman. I subsequently audited the design and test documentation as submitted by the subcontractor (name removed) and found it to be of little, if any value. It was obvious that the data provided was not contractual and the budget for CPF life cycle support would then provide the on-going, nearly infinite source of cash for certain vested interests.

Conclusion and Supporting Discussion

No merit. The 1990 CPF Combat System Work Around Plan, developed in response to the problems encountered in establishing the requirements baseline for the Combat System Software (CSS), was incorporated into the prime contract PAAA (June 1991) as the "Work Around Plan for Software Development in CPF". Task #2 of the plan required the prime contractor to identify all vendor software which formed part of the CPF combat systems and place there associated documentation under configuration management. The Work Around Plan ultimately enabled the contractor to deliver the lead ship with Release 1 of the Command and Control Software (CCS), thus allowing the Crown to provisionally accept the lead ship pending final acceptance of the CSS.

With respect to DID 898, DID is the acronym for Data Item Description, a description of the data item to be delivered. Since DID 898 does not exist, we assumed that the concern is related to DID CX-898, which describes the data deliverables for existing or slightly modified software, also known as vendor software. ME003 is the DID that prescribes the procedure for submitting all deviation requests. While the contract requires that technical data packages and program packages be provided for existing or vendor software, it includes a provision whereby the contractor may provide existing documentation for existing software as long as it complies with DID CX-898. However, the contract does provide relief to the contractor's obligation to provide background technical data or background computer software, as long as the contractor has exerted "best efforts" to obtain the data.

The subcontractor had some difficulty in obtaining proprietary data from OEMs, because the subcontractor is a competitor of many of the OEMs. We reviewed a number of letters from the contractor to the Crown describing the contractor's best efforts. If the Crown was satisfied that the contractor had expended best effort, the contractor was discharged of its obligations, thus negating the requirement to raise a request for deviation from contractual technical requirements. In instances where the contractor was unable to secure the required data, the CPF PMO referred the matter to the applicable life-cycle materiel manager to make appropriate licensing arrangements with the OEM. We understand that difficulties in obtaining technical data directly from the OEMs have not been encountered.

Concern No. 41 — Warranties Not In Writing

May we see the stipulated Contractor warranties and indemnities in writing? The Contracting Authority, DSS, should also be able to provide supporting official data per Schedule K, Schedule L and Schedule M, etc. as it must assuredly be in your government's possession.

Conclusion and Supporting Discussion

No merit. The warranty provisions and the contractor's indemnity relative to warranty are specified in the contract. For more information refer to Section 13.1.6.

Concern No. 42 — Warranty Capped

Investigate why the Warranty cap was defined at all and to what budget line item costs have been approved for payment for basically fixed price CPF Contract deliverables.

Conclusion and Supporting Discussion

No merit. For more information refer to the discussions included in Concerns No. 35, 36 and 37 of this Annex.

Concern No. 43 — Warranty Payments

Have warranty payments flowed down to the Class I and Class II subcontractors?

Conclusion and Supporting Discussion

No merit. Although this concern refers to Article J17.9.1 of the contract which, describes the limitation placed on the contractor's liability relative to warranty claims for defects in the material and workmanship of each ship; the context for the concern is unclear. Based on the other warranty concerns, it is assumed that this concern relates to payments for warranty work on the CSS.

As discussed in the response to Concern No. 38 in this Annex, the CSS warranty on design expired prior to final acceptance so there were never any warranty costs incurred by the prime contractor or subcontractors or warranty payments made related to the CSS. As such, there is no evidence to substantiate this concern.

Concern No. 44 — Contract Amendments Inappropriately Approved

Contract amendments raised for Integrated Logistics Support (ILS) contracts were inappropriately approved.

Conclusion and Supporting Discussion

No merit. The complainant asserted that the prime contractor frequently came back to PWGSC after contract award and requested increases to firm prices or adjustments to foreign exchange rates long after the Crown had paid the contractor. The concern relates to spares procurement under SRP I only.

Our review of a number of randomly selected files identified two instances where an administrative error relative to pricing had been made by the contractor and was subsequently corrected by contract amendment. We also found one instance where the contractor submitted a claim for a foreign exchange adjustment well after it had been paid. In all cases, the amount of money involved was insignificant.

Acronym List

- A -

ADDAM – Analytic Discrete Event Distributed Architecture Model

- B -

BY – Budget Year

- C -

CCF – Change Control Form
CCP – Contract Change Proposal
CCS – Command and Control Software
CDRL – Contract Data Requirements List
CFSS – Canadian Forces Supply System
CMIS – Configuration Management Information System
CMP – Configuration Management Plan
CMS – Configuration Management System
COI – Conflict of Interest
CPF – Canadian Patrol Frigate
CRF – Consolidated Revenue Fund
CRS – Chief of Review Services
CSCS – Cost/Schedule Control System
CSOFR – Combat System ORTT Functional Requirement
CSS – Combat System Software
CST – Combat Systems Trainer
CSTSF – Combat System Training and Support Facility

- D -

DDP – Detailed Design Phase
DGA – Director General Audit
DGAR – Director General Audit and Review
DND – Department of National Defence
DSEI – Directorate of Special Examinations and Inquiries

- E -

EAC – Estimate at Completion

- F –

FAT – Factory Acceptance Test
FIS – Financial Information System

- G -

GFE – Government Furnished Equipment

- H -

- I -

IP – Initial Provisioning
IPC – Initial Provisioning Conference
IRB – Industrial Regional Benefits

- J -

- K -

- L -

- M -

MARCOM – Maritime Command
MCP – Major Crown Project
MOA – Memorandum of Agreement
MOU – Memorandum of Understanding

– N –

- O –

OAA – Overall Amending Agreement
OAG – Office of the Auditor General
OPI – Office of Primary Interest

- P –

PAAA – Provisional Acceptance Amending Agreement
PGC – Program Generation Centre
PMO – Project Management Office
PWGSC – Public Works and Government Services Canada

- Q –

QA/T&E – Quality Assurance/Testing and Evaluation

- R -

RFP – Request for Proposal

- S –

SDD – Software Design Document
SOR – Statement of Requirements
SRB – Senior Review Board
SRD – Software Requirement Document
SRP – Ship Replacement Program

- T -

TSI – Total System Integration
TSIR – Total System Integration Responsibility
TSR – Total System Responsibility

- U -

- V -

-W -

WAP – Work Around Plan

- X -

- Y -

- Z -