



National Défense  
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Chief Review Services Chef - Service d'examen

CRS  CS Ex

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## Internal Audit: CP140 Aurora Data Management System Contract

August 2007

7050-27 (CRS)



Canada 

## CAVEAT

This audit is not intended to assess the performance of contractors; rather, it is an internal assessment of processes and practices within ADM(Mat). Contractors have not been interviewed or otherwise asked to provide comment or feedback.

The level of effort on this audit has resulted in a high level of assurance.



## TABLE OF CONTENTS

<b>LIST OF ACRONYMS AND ABBREVIATIONS .....</b>	<b>i</b>
<b>RESULTS IN BRIEF .....</b>	<b>ii</b>
<b>INTRODUCTION.....</b>	<b>1</b>
Background .....	1
Objective.....	2
Scope .....	2
Methodology .....	2
Criteria .....	2
<b>FINDINGS AND RECOMMENDATIONS .....</b>	<b>3</b>
Terms of Payment .....	3
Value for Money .....	6
Vendor Reporting Framework.....	8
Risk Management Framework.....	9
Certification of Payments.....	10
Materiel Management.....	11
<b>ANNEX A—MANAGEMENT ACTION PLAN .....</b>	<b>A-1</b>
<b>ANNEX B—AUDIT CRITERIA SCORECARD.....</b>	<b>B-1</b>
<b>ANNEX C—FIRM LOT REQUIREMENTS.....</b>	<b>C-1</b>



## LIST OF ACRONYMS AND ABBREVIATIONS

A/C	Aircraft	FAA	<i>Financial Administration Act</i>
ADM(IE)	Assistant Deputy Minister (Infrastructure and Environment)	FDS	Flight Deck Simulator
		FFP	Firm fixed price
ADM(IM)	Assistant Deputy Minister (Information Management)	FMAS	Financial Managerial Accounting System
ADM(Mat)	Assistant Deputy Minister (Materiel)	GFE	Government furnished equipment
AIMP	Aurora Incremental Modernization Project	IMS	Integrated Master Schedule
ASC	Audit Services Canada	MAD	Magnetic Anomaly Detector
CDR	Critical Design Review	OMS	Operational Mission Simulator
CDRL	Contract Data Requirements List	PCT	Procedure Crew Trainer
CFSS	Canadian Forces Supply System	PDR	Preliminary Design Review
CMS	Comm Management System	PMB	Program Management Board
COS	Chief of Staff	PMO	Project Management Office
CPT	Cockpit Procedures Trainer	PWGSC	Public Works and Government Services Canada
CRS	Chief Review Services	QAR	Quality assurance representative
DDSAL	Director Disposals, Sales, Artifacts and Loans	RMP	Risk Management Plan
DGAEPM	Director General Aerospace Equipment Program Management	SOO	Statement of Objective
DGMSSC	Director General Materiel Systems and Supply Chain	SRB	Senior Review Board
DMS	Data Management System	SS(EPA)	Synopsis Sheet (Effective Project Approval)
DND	Department of National Defence	TB	Treasury Board
DQA	Director Quality Assurance	VCDS	Vice Chief of the Defence Staff
EO/IR	Electro-Optic/Infra-Red	WBS	Work breakdown structure
ESM	Electronic Support Measures		



## RESULTS IN BRIEF

In 2004, Chief Review Services (CRS) developed a contract risk analysis methodology<sup>1</sup> to distinguish active contracts that exhibited higher-risk attributes. This methodology identified the seven-year \$197-million<sup>2</sup> CP140 Aurora Data Management System (DMS) contract as the highest risk contract warranting audit attention.<sup>3</sup> As this contract value was only 4.8 percent of all goods contracts greater than \$1 million in value, the audit findings are not representative of the Department of National Defence (DND)'s overall contracting practices. However, many lessons learned and best practices resulting from this audit can be applied to other goods contracts.

The DMS contract was awarded in 2002 for the integration of the CP140 Aurora Maritime patrol aircraft's upgraded avionics and sensor systems. Due to the incremental nature of the CP140 modernization program, the DMS contract scope was amended to accommodate the changes to the project. By June 2005 major amendments had increased the DMS contract value to \$329 million in order to provide training simulators and the integration of additional sensors.

### Overall Assessment

The results of this audit preclude us from providing assurance that information for decision making, and control management frameworks are in place to effectively manage the DMS contract.

Since the CP140 modernization program was incremental in nature, the full requirements were not known until year four of the nine-year contract resulting in amendments that made it difficult to manage and invoke the appropriate terms of the contract.

Contract management can be improved by revising and enforcing the DMS contract terms and conditions in order to better manage delays in operational capability and accurately project costs at completion.

## Findings and Recommendations

**Terms of Payment.** The DMS contract was difficult to manage because the expenditure limitation was not aligned with the contract payment schedule. If the expenditure limitation had been amended, .....

It is recommended that the contract be amended to realign the contract expenditure limitations with the contract payment schedule.

**Value for Money.** Sole-source amendments worth ..... necessitated by the incremental nature of the CP140 modernization program, .....  
.....

<sup>1</sup> CRS Report – *Preliminary Risk Analysis of Contracts* January 2004.

<sup>2</sup> All numbers in the report are excluding taxes.

<sup>3</sup> *Risk Analysis of Goods Contracts*, April 2007.



.....  
.....  
.....

**Vendor Reporting Framework.** .....  
.....  
.....

It is recommended that the contract be amended .....  
.....

**Risk Management.** A sound risk management framework was put in place to manage this contract. However, DND guidelines do not include standard best practices to quantify financial risk. ....  
.....

It is recommended that DND risk management guidelines require PMOs to quantify and report financial risks to Senior Review Board (SRB) and the Project Management Board (PMB) and ....  
.....

**Certification of Payments.** There was not enough documentation for the approval authority ...  
.....  
.....

It is recommended that DND .....  
.....  
.....

**Materiel Management.** DND should provide more oversight of government furnished equipment (GFE) held at the vendor facility. The recorded value of such GFE is \$4.5 million.  
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.....  
.....

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

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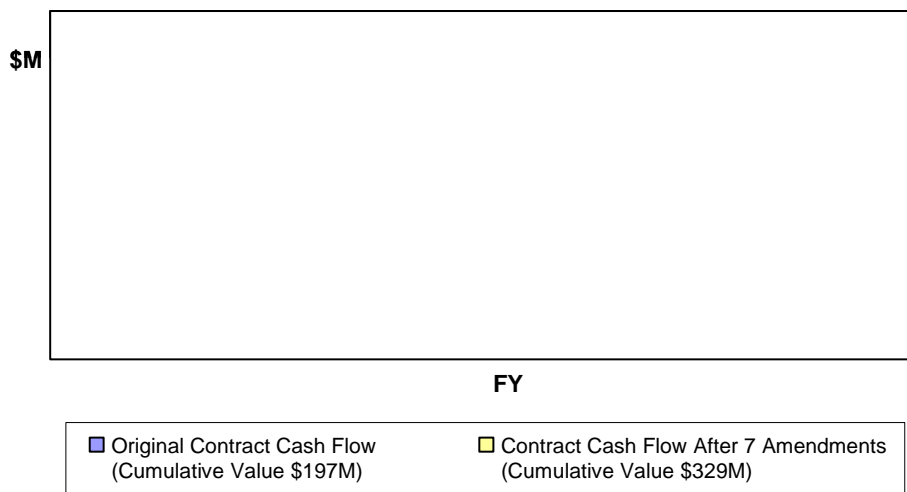
## INTRODUCTION

### Background

In 2004, CRS developed a methodology to identify contracts exhibiting high-risk attributes. The risk analysis of goods contracts greater than \$1 million in value included 380 contracts worth \$4.1 billion. This analysis identified the Aurora Incremental Modernization Project (AIMP) DMS contract as the highest-risk contract warranting audit attention. The findings resulting from this audit do not represent the overall DND/CF contracting practices.

The seven-year \$197-million CP140 Aurora DMS contract was awarded in May 2002 to design and integrate an upgraded flight computer and sensors to 18 Aurora maritime patrol aircraft. The incremental nature of the Aurora modernization project was such that the full DMS requirements were not known until June 2005. Therefore, several amendments, worth \$132 million in total, were added to the scope of the contract and the expiry date was extended from ..... to accommodate the additional work, as portrayed in Figure 1. The DMS contract was flagged for audit due to the following risk indicators:

- Contract value increased by more than 20 percent—a 67 percent increase from \$197 million to \$329 million;
- Higher-risk method of payment—75 percent of the contract value was progress payments;
- .....
- .....



**Figure 1. Annual Contract Cash Flow.** The \$197-million DMS contract was awarded in FY 2003 (blue). By FY 2006 the contract value had increased to \$329 million (yellow). The contract period was extended from .....



## Objective

The objective of this audit is to provide assurance that information for decision making, risk management and control frameworks are in place to effectively manage the DMS contract.

## Scope

- Management of the contract post request for proposal.
- Audit of the prime contractor/subcontractors was out of scope. ....
- Twenty-three percent ..... of the total expenditures ..... from June 2002 to June 2006 were sampled.
  - The monthly progress payments sample included the five largest progress claims totaling ..... Progress payments accounted for 75 percent of all payments;
  - Of the 12 milestones completed at the time of audit, four milestone payments were sampled totaling .....
  - .....

## Methodology

- Development of detailed audit criteria to perform audit tests on a directed sample that identified systemic issues.
- Analysis of relevant data within the Financial Managerial Accounting system (FMAS) and the Canadian Forces Supply System (CFSS).
- Interviews with PMO staff, Director Accounts Processing, Pay and Pensions, Director Quality Assurance (DQA) and Director Disposals, Sales, Artifacts and Loans (DDSAL).
- Contract documentation review such as monthly progress and cost reports, loan reports, and monthly claims.

## Criteria

The audit criteria scorecard is at [Annex B](#).





## FINDINGS AND RECOMMENDATIONS

### Terms of Payment

*Misalignment of the contract payment schedule with the principal terms of payment has made it difficult for DMS project staff to manage the contract.*

### Expenditure Limitation

- One principal contract term of payment is the limitation of expenditure contract clause that protects the Crown “in the event of schedule delays and unsatisfactory progress of the work attributed to the contractor.”<sup>4</sup> From the outset of the contract the expenditure limitation clause was not in alignment with the contract payment schedule. For the “prototype installed” milestone the contract expenditure limitation was set at only 30 percent (\$59 million) of the original contract price (\$197 million). However, the original payment schedule valued “prototype installed” work at ..... of the contract total, a difference of .....
- ..... By October 2006 (amendment 7), the contract schedule was extended for a total of 13 months from the 2005 baseline schedule ..... Because the expenditure limitation threshold of 30 percent for “prototype installed” was set too low, the vendor could not be held accountable for achieving the milestone listed in Table 1. The value of the expenditure limitations in Table 1 reflects the current contract value and the amendment 7 payment schedule.

Milestones	Expenditure Limitation	Contract Value (net of taxes)	Expenditure Payment Limitation (1)	Amendment 7 Payment Schedule (2)	(2)-(1) Amount Exceeding Limitation
Preliminary Design Review (PDR)	.....	\$329,692,994	.....	.....	.....
Critical Design Review (CDR)	.....	\$329,692,994	.....	.....	.....
Prototype Installed	.....	\$329,692,994	.....	.....	.....
Prototype Accepted	.....	\$329,692,994	.....	.....	.....

**Table 1. Contract Expenditure Limitations.** *The payment schedule for the first two completed milestones (PDR, CDR) exceeded the expenditure limitations by ..... The payment schedule for the prototype installation is projected to exceed the current expenditure limitation by .....*

<sup>4</sup> Section 50.0 Milestones/Progress Payments – Requirements and Limitations, W8485-01NA22/001AIM.

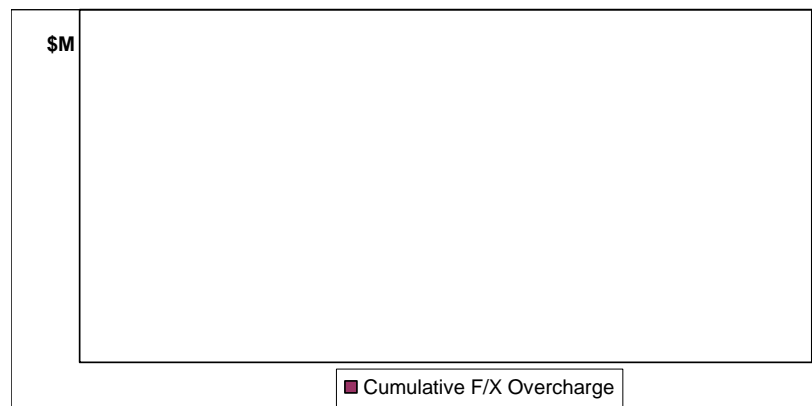


- With the October 2006 amendment 7 and .....  
 ....., the payment schedule to the vendor for the “prototype installed” will  
 represent ..... of the contract value. Using the more realistic ..... limitation and  
 .....  
 .....  
 .....  
 .....

**Production Phase Payments.** The payment schedule holdbacks for the production phase do not adhere to the terms of payment. For every month, the payment schedule allows for a 10-percent holdback as opposed to the contractual 25 percent. Currently there are monthly payments for a 20-month period for the delivery of 16 aircraft—..... in total. However, payments of ..... will be made over four of the months where there are no deliverables, with only a 10-percent holdback. As it is the intent of the DMS project office to only make milestone payments in the production phase, for those four months with no deliverables, the payments of ..... should be redistributed to the other 16 months that have milestone payments linked to the delivery of the aircraft. Otherwise an additional 15 percent holdback should be added to the four months of payments with no deliverables—..... in total.

**Contract Price.** The payment schedule did not include ..... of identified additional work. Therefore, the total payment schedule (amendment 7) did not reconcile with the total contract price.

- The contract price could be affected by .....  
 ..... worth ..... As shown in Figure 2, CRS estimates future foreign exchange differences of .....<sup>5</sup> over the life of the radar prototype amendment, which must be reconciled with the current exchange rate at the time of payment.



**Figure 2. Annual Cumulative Foreign Exchange Differences.** .....  
 .....  
 .....

<sup>5</sup> .....  
 .....



**Production Milestones.** Based on the contract expenditure trend, during the production phase the contract ceiling will be reached ..... prior to the contract expiry date.

- .....
- Given the lower risk in the production phase, payments should be made by milestone.

**Firm Lot Prices.** The contract basis of payments includes firm lot prices for deliverables listed at [Annex C](#). Each deliverable has an amount allocated where “the Contractor shall be paid Firm Lot Prices” suggesting there would a specified dollar allocation for each deliverable completed. However, the firm lot prices were used for the purpose of tendering bids, not as the basis of payment. Therefore, as the firm lot prices do not align with the contract payment schedule, they serve no purpose.

### Recommendation

OPI	Recommendation
ADM(Mat)/DGAEPM/ PMO Aurora	Request that PWGSC amend the contract to align expenditure limitations, update payment schedules and eliminate firm lot prices. Any additional payments to the vendor in the production phase should be milestone payments.



## Value for Money

*Value for money assurance cannot be provided for amendments worth ..... because they were sole-sourced to the prime contractor.*

**Sole-Source Amendments.** The incremental nature of the CP140 Aurora modernization has resulted in ongoing changes in DMS requirements. Listed in Table 2, amendments #4, #5, and ..... were not costed options in the original contract tendering process. Even if the PMO had carefully scrutinized the vendor's proposal, it still might not have been possible to get the best value for money for the new sole-sourced requirements identified by AIMP. For each of these three amendments, the following concerns were raised:

- **\$58 Million Radar (Amendment 5).** .....  
.....
- .....**Follow-on Radar for Production (Future Amendment).** .....  
.....  
.....
- **\$15 Million PCT (Amendment 4).** .....<sup>6</sup> .....  
.....  
.....  
.....

Amendments	Date	Increase in Value	Contract Value
# 1 – OMS	Apr-03	.....	.....
# 2 – Initial work on MAD	Oct-03	.....	.....
# 3 – MAD	Jul-08	.....	.....
# 4 – PCT	Apr-05	.....	.....
# 5 – Radar & Truss *	Jul-05	.....	.....
# 6 – CMS technical data	Feb-06	.....	.....
# 7 – Radar and Sonobuoy	Oct-06	.....	\$329,692,994
Future Radar Production	Future	.....	.....

**Table 2. Contract Amendments.** *The sole-source amendments for future radar production, PCT and Radar represent ..... of the total value of the amendments .....*

*\* Truss, imagery and publications amounted to .....*

<sup>6</sup> The PCT is paid as separate milestones (actual costs do not need to be reported). .....



..... In April 2006, a radar integration fee adjustment of .....  
 .....  
 .....

Instead of paying the rate fee in one lump sum, DND could have paid the blended fee in installments going forward over the contract period, resulting in a savings of \$57,000 for the cost of capital.<sup>7</sup>

## Recommendation

OPI	Recommendation
ADM(Mat)/DGAEPM/ PMO Aurora	..... ..... .....

<sup>7</sup> Assuming four payments of \$156,000 at the end of each year from 2005-2009 using an interest rate of 4 percent for the cost of capital.



## Vendor Reporting Framework

.....

.....

.....

**Vendor Reporting.** The contract required that the vendor provide 135 types of Contract Data Requirements List (CDRL) deliverables. ....

- .....
- .....
- .....  
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  - .....  
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  - .....  
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  - .....  
.....

**Review of Deliverables Workload.** More resources are required to accept and review CDRLs in a timely manner. For example, 64 percent<sup>8</sup> of the CDRLs received had not been reviewed within 60 days from receipt. A significant delay in the review of deliverables will hinder information for decision making and could lead to delays in the project. To mitigate this risk, PMO Aurora requested the contractor to identify high priority CDRLs to ensure that they were reviewed in a timely manner.

### Recommendations

OPI	Recommendation
ADM(Mat)/DGAEPM/ PMO Aurora	<ul style="list-style-type: none"> <li>• Request that PWGSC amend the contract ..... .....</li> <li>• Ensure project resources are available to review reports in a timely manner.</li> </ul>

<sup>8</sup> The contract required a number of CDRLs to be delivered multiple times depending on the contract milestones (e.g., monthly progress report). A total of 519 CDRLs were sampled from August 2005 to August 2006—334 of these CDRLs had aged more than 60 days.



## Risk Management Framework

*Although PMO AIMP established a robust risk management framework, DND guidelines do not include some standard best practices. In addition, .....*

**DND/PMO Risk Management.** The risk management framework for the DMS contract was well developed. However, some standard practices could be adopted by DND to address some of the observations listed below.

- Although quantification of risks is a standard practice in the Project Management Institute<sup>9</sup>, senior management boards are not provided quantified cost impacts. For example, the cost schedule and performance level of risk (medium to high) was reported to SRB/PMB yet the associated dollar value of these risks was not communicated.
- .....
- There was no identifiable process in the risk register for the calculation of individual risk cost impacts.
- Cost impact for schedule risks such as additional project management person requirements were not determined.
- A sample of risks in January 2006, did not have contingency plans, including the highest ranked risk. However, the PMO has since improved their risk management practices and currently 80 percent of the risks, including the top 20 percent, all include contingency plans.

### Best Practice

The PMO AIMP risk management framework included identification, ranking and mitigation of risks. Most notable were the use of risk registers, DND-vendor monthly risk management working groups, regular updating of risk levels, and risk reporting at each management level.

**Vendor Risk Management Plan.** The vendor developed a detailed Risk Management Plan (RMP) as part of the contractual requirements. The vendor's RMP outlined the risk management process in great detail, including .....

- .....  
10
- .....

## Recommendations

OPI	Recommendation
VCDS	Require Level 1 project leads to aggregate all project risks and report the cost and scheduling impact of mitigation/contingency plans to SRB/PMB.
ADM(Mat)/DGAEPM/ PMO Aurora	..... .....

<sup>9</sup> PMBOK Chapter 11, Section 11.2.

<sup>10</sup> Review of Monthly Progress Reports compared with Risk Management Plan.



## Certification of Payments

..... .....
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**Foreign Exchange Charges.** At least ..... of radar work integration was contracted to a .....

- The contract requires that sufficient documentation be provided by the vendor to determine that the correct exchange rate was applied to the subcontracted work— “provide appropriate documentation showing evidence of payment for the items included in the invoiced amount.”
- At the time of audit, payments for this work had amounted to approximately .....
- .....  
.....

## Recommendation

OPI	Recommendation
ADM(Mat)/DGAEPM/ PMO Aurora	..... ..... .....





## Materiel Management

*More oversight is required by the DMS project staff and DDSAL to account for GFE worth \$4.5 million.*

**Government Furnished Equipment Listing.** DND recorded assets, worth \$4.5 million, were loaned to the vendor to allow the work to progress. ....

- The vendor was obligated to report the status of all GFE on a quarterly basis. ....
- The DMS project office GFE list and CFSS GFE loan account were not reconciled. Twenty-three percent of the line items valued at \$272,000 reported on the project office GFE list were not in the CFSS loan account. Upon completion of the DMS contract, loaned DND assets may not be returned if there is no accurate record of the loan.

**Loan Account Management.** DDSAL is responsible for managing the GFE loan account in accordance with the DMS contract loan agreement. The CFSS GFE loan account was found to be inaccurate by including line items where the loan period had either expired or exceeded the nine-year contract period. Eight percent of the GFE items valued at \$943,000 in the CFSS GFE loan account were incorrect, as shown in Table 3.

	Quantity of Items	Value
Total	36	\$4,547,247
Expired	2	\$213,061
2025 date	1	\$730,000

**Table 3. CFSS GFE Loan Account.** *Of the 39 items held by the vendor, two loans had expired, and one was on loan until 2025.*

## Recommendation

OPI	Recommendation
ADM(Mat)/DGAEPM/ PMO Aurora ADM(Mat)/DGMSSC/ DDSAL	..... .....





## ANNEX A

Ser	CRS Recommendation	OPI	Management Action	Target Completion Date
4.	<b>Risk Management Framework:</b> <b>DND/PMO Risk Management.</b> Require Level 1 project leads to aggregate all project risks and report the cost and scheduling impact of mitigation/contingency plans to SRB/PMB.  <b>Vendor Risk Management Plan.</b> ..... ..... .....	VCDS      ADM(Mat)/ DGAEPM/ PMO Aurora	COS ADM(Mat), COS ADM(IM) and COS ADM(IE) were tasked to conduct a thorough investigation of tools and methodologies for assessing risk and potentials for quantification of risk for presentation to PMB in October 2007. Direction will be provided by PMB in March 2008 to rewrite risk management sections in the Project Approval Guide.  ..... ..... .....	July 2008      Complete
5.	<b>Certification of Payments.</b> ..... ..... ..... ..... ..... .....	ADM(Mat)/ DGAEPM/ PMO Aurora	..... ..... ..... .....	Complete
6.	<b>Materiel Management.</b> ..... ..... ..... ..... .....	ADM(Mat)/ DGAEPM/ PMO Aurora  ADM(Mat)/ DGMSSC/ DDSAL	..... ..... .....  The GFE report will be reconciled with PMO and DDSAL records.	November 2007



**ANNEX B—AUDIT CRITERIA SCORECARD**

Criteria	Rating	Observation
<b>Risk Management Framework</b>		
Risks understood / appropriately managed		Improve contingency / aggregate reporting. ....
Crown indemnification and contractor insurance		.....*
Contract provisions for termination in place		Compliant *
Warranty provisions reduce risk to the Crown		Updated warranty six months after last installation *
Contract dispute resolution provisions in place		No dispute resolution clause *
<b>Information for Decision Making</b>		
Appropriate monitoring & reporting strategies in place		Better reporting to achieve operational objectives
Decision-making information is reliable		.....*
A vendor performance measurement system in place		.....
<b>Management Control Framework</b>		
Roles / responsibilities are clear		No QAR involvement - Unclear if DQA or Project role *
Contract management staff trg, experience, workload		Requirements validation / staff shortfall *
Oversight exists to monitor value for money		Sole sourced amendments valued at .....
Procured/loaned assets safeguarded & accounted for		Reconciliations should be done for GFE .....
Payments are IAW FAA, TB, PWGSC regulations		.....
Flow down of contract terms to subcontractors		.....*
SOO sufficiently describes operational requirements		DMS mapping to IMS concerns *
Optimal terms of payment		Incorrect expenditure limitation; Milestone payments not optimized for production
Shared set of values and ethics		Compliant *



Satisfactory



Needs Minor Improvement



Needs Moderate Improvement



Needs Significant Improvement



Unsatisfactory

DMS project staff were briefed on observations denoted with an asterisk (\*) but details are not included in this report.



**ANNEX C—FIRM LOT REQUIREMENTS**

<b>Deliverable</b>	<b>Value</b>
Prototype	.....
Form Fit A/C	.....
Production A/C	.....
Integrated Avionics Trainer	.....
Equipment and data for FDS, CPT and OMS and other training	.....
Integration and install of EO/IR	.....
Integration and install of ESM	.....
Integration and install of acoustics	.....
OMS	.....
Initial Analysis of MAD	.....
Procedures Crew Trainer	.....
Integrate Radar System	.....
Development of Truss	.....
Other Items less than \$600K	.....
<b>Total (tax not included)</b>	<b>\$329,692,994</b>

The contract basis of payment states that the vendor will be paid firm unit and lot prices as detailed in the firm requirements.

