National Defence Défense nationale

Chief Review Services Chef - Service d'examen

CRS CS Ex

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INTERNAL AUDIT: *Combat System Engineering Support Contract*

October 2006

7050-24 (CRS)

Canada

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CAVEAT

It should be noted that this audit is not intended to assess the performance of contractors; rather, it is an internal assessment of processes and practices within Assistant Deputy Minister (Materiel). Contractors have not been interviewed or otherwise asked to provide comment or feedback.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAW	Anti-Air Warfare
ADM(Mat)	Assistant Deputy Minister (Materiel)
AHWCS	Advanced Harpoon Weapon Control System
CCS	Command and Control System
CFSS	Canadian Forces Supply System
CM	Configuration Management
CMS	Chief of the Maritime Staff
COMDAT	Command and Decision Aid Technology
CPI	Cost Performance Index
CRS	Chief Review Services
CSES	Combat System Engineering Support
CSTC	Combat System Training Centre
DGMEPM	Director General Maritime Equipment Project Management
DIHRS	Defence Integrated Human Resource System
DM	Data management
DMMS	Director Maritime Management Support
DMSS	Director Maritime Ship Support
DND	Department of National Defence
DOORS	Documentation of Operational Requirements System
ESSM	Evolved Sea Sparrow Missile
FAA	*Financial Administration Act*
FFP	Firm fixed price
FMAS	Financial Managerial Accounting System
FY	Fiscal year
GAO	General Accounting Office
GCCS-M	Global Command and Control System – Maritime
GSAM	Guidelines for Successful Acquisition Management
GTAG	Global Technology Audit Guide
HAL/IRO	Halifax/Iroquois
HFX	Halifax
HMCS	Her Majesty's Canadian Ship
IEEE	Institute of Electrical and Electronics Engineers
IIA	Institute of Internal Auditors
IPME	Integrated Project Management Environment
IPSE	Integrated Project Support Environment
IT	Information technology
LCMM	Life-Cycle Materiel Manager
LOE	Level of effort
LTD	Local Task Directive
MASIS	Materiel Acquisition and Support Information System
MIAMS	MARPAC Information Assets Management System
MSDF	Multi-Source Data Fusion
NDHQ	National Defence Headquarters
NEWC	Naval EW Centre
OPI	Office of Primary Interest
ORAC	Operational Requirements Analysis Cell
PGC	Program Generation Centre
PWGSC	Public Works and Government Services Canada
PY	Person year
SASIE	System Analysis Simulation Evaluation
SBN	Single Board Node

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SIM	Simulator
SLOC	Source Lines of Code
SOW	Statement of Work
SPI	Schedule Performance Index
SPR	System Problem Report
SSS	Simulation Support System/Segment Specification
STS	Soloman Teamware System
STW	Set-to-Work
SW	Software
TATD	Technical Authority Task Directive
TB	Treasury Board
TI	Technical Investigation
VLESSM	Vertical Launch Evolved Sea Sparrow Missile

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RESULTS IN BRIEF

An audit of the Combat System Engineering Support (CSES) contract was done because the contract exhibited higher-risk attributes, namely:

- Growth in contract value (34 percent in the first four years);
- A statement of work with unspecified deliverables;
- Five different major subcontractors;
- "Time and material cost plus" terms of payment with no performance incentives;
- Six amendments to the contract, where the Department of National Defence (DND) norm is three; and
- A centrally managed contract that served navy customers on both coasts.

The contract was initially a $44 million (net GST/HST) competitively tendered four-year contract that started in July 2000. Since that time, three option years have been exercised for a new contract ceiling of $119 million. At the time of audit (June 2005), $77 million had been spent.

Overall Assessment

The results of the audit preclude us from providing assurance that:

- Contract payments are made in compliance with applicable policies/regulations;
- Appropriate monitoring and reporting strategies are in place; and
- Risks are understood and appropriately managed.

Of the audited amount ($74 million), nearly $15 million (i.e., 20 percent) in payments were made with insufficient supporting documentation on file. In addition, for the remaining two years of the CSES contract, cost escalation can be reduced, resulting in a costs savings of nearly $4.8 million.

Main Observations and Recommendations

Cost Escalation. A comparison of the annual maintenance costs of five other navies to the Canadian CSES costs found that the Halifax class was 7.9 percent higher than the average allied frigate CSES costs. The audit identified the following four areas where annual savings totalling $2.4 million could be achieved for each of the remaining two years:

Severed under Section 20(1)(c) of the AIA Third party information

- Recurring work estimation ……..;
- Management of core and non-core labour …….;
- Restructure of core person year (PY) structure…….; and
- Introduction of a third negotiated rate …….;

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To achieve the savings, it is recommended that the total costs of annual recurring work remain within core annual rate escalations, the annual 150,000 core capacity rate charges be reconciled at year-end, the appropriate category of personnel be assigned to core work, and the requirement for a negotiated third rate in a competitively tendered contract be revisited by Public Works and Government Services Canada (PWGSC).

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b) Advice, etc.

Certification of Payments. For $14.5 million of the $74 million payments examined, insufficient documentation was found to support the *Financial Administration Act* (FAA) Section 34 certification. …… …… The major concerns are insufficient evidence for the receipt of material, uncertified progress claims, and …… ……

Severed under Section 21(1)(c) of the AIA Advice, etc.

It is recommended that FAA Section 34 certification be applied more rigorously to address receipt of material, variance in labour billings, core PY restructure, subcontract rates/markups, tax overcharges, and travel expenses. ……. ……..

Vendor Reporting. CSES contract managers did not ensure that vendor reports were compliant with contractual reporting formats. Nor was the vendor tasked to report on performance metrics that were maintained by the vendor in accordance with the contract. Without these metrics, it was not possible to determine cost/schedule performance indices, the progress of the work and the productivity of the vendor.

It is recommended that the vendor be required to provide all reports and metrics stipulated in the contract. Metrics should be analyzed and validated in order to establish a baseline for performance incentives in the follow-on contract.

Severed under Section 20(1)(b)(c) of the AIA Third party information

Quality Assurance/Warranty. The technical authority and the Director Maritime Ship Support (DMSS) Detachments were not aware that a 12-month design warranty existed in the contract general conditions. As a result, the Department was charged for …… of correctional work that was covered under the warranty.

It is recommended that a review be conducted of major correctional work performed under the CSES contract that could qualify as a design warranty claim for potential recoveries.

Note: A complete list of recommendations and the management action plan may be found at Annex A—Management Action Plan.

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INTRODUCTION

Background

In 2003, Chief Review Services (CRS) developed a methodology to identify contracts exhibiting higher-risk attributes. Application of this analysis identified the CSES contract as warranting audit attention.

The CSES contract provides for combat system engineering and integration services for the navy's 12 Halifax-class ships, three Iroquois-class ships, simulation trainers, and system support facilities at Halifax and Esquimalt.

As shown in Figure 1, the contract was initially a $44 million (net GST/HST) competitively tendered four-year contract that started in July 2000. Since that time, option years have been exercised to Fiscal Year (FY) 2007 and the contract ceiling has increased to $119 million. There remains one more option year that will extend the contract to March 2008. At the time of audit (June 2005), $77 million had been spent. The FY 2007[1] option year is expected to be $23 million.

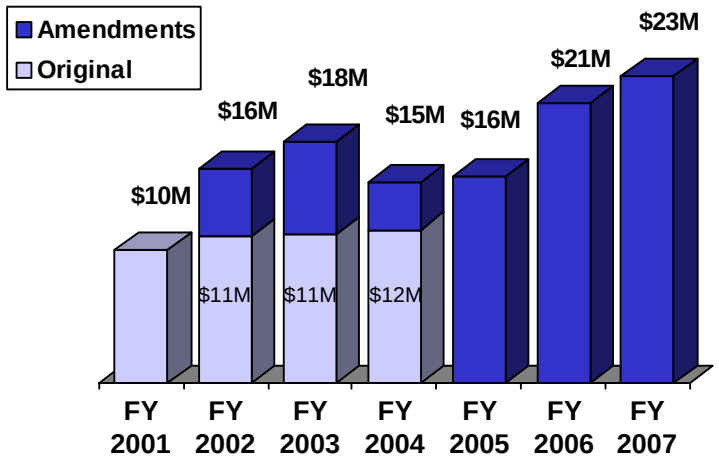

Figure 1—CSES Contract Ceiling $119 Million.
First four years were amended from $44 to $59 million to reflect actual expenditures.

Objectives

To provide assurance that information for decision-making and that management frameworks, including risk mitigation strategies, are in place to effectively manage the CSES contract. The objectives of the audit are to determine if:

- Contract payments are made in accordance with current policies;
- Appropriate monitoring and reporting strategies are in place; and
- Risks are understood and appropriately managed.

[1] FY 2007 represents 1 April 2006 to 31 March 2007. All FYs in the report are reflected in this manner as an FMAS convention.

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Scope

- Expenditures totalling $77 million on the CSES contract from July 2000 to June 2005.
- Audit of the prime contractor/subcontractors was out of scope. The audit team was advised that Consulting and Audit Canada was also performing an audit on the CSES contract.

Methodology

- Analysis of the data in the Financial Managerial Accounting System (FMAS), the Materiel Acquisition and Support Information System (MASIS), the Canadian Forces Supply System (CFSS), the MARPAC Information Assets Management System (MIAMS), and the Defence Integrated Human Resource System (DIHRS).
- Site visits: DMSS Detachments and Operational Requirements Analysis Cells (ORAC) at Halifax and Esquimalt, HMCS Athabasca and HMCS Regina.
- File review/interviews of key staff from Director Maritime Management Support (DMMS) and DMSS.
- Benchmarks with other allied navies, US Air Force system integration process.
- Sample size—23 progress claims totalling $39 million examined in detail. Additional labour costs totalling $35 million were examined.

Criteria

- Detailed criteria were developed to assess whether the information for decision-making and management control framework, including risk mitigation strategies, are in place to effectively manage the CSES contract. For a detailed list of criteria see Annex B.

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OBSERVATIONS AND RECOMMENDATIONS

Cost Escalation

The CSES contract experienced a 7.0 percent cost growth beyond the contractual rates stipulated for recurring work, resulting in higher costs than allies. Improvements in task/labour management and rate negotiations could result in savings of $4.8 million for the remaining two years of the contract.

Comparison with Allied Combat System Engineering Costs

- As shown in Table 1, a comparison with the averaged annual maintenance costs from five other navies found that the Canadian frigate CSES was 7.9 percent higher.
- Allied costs ranged from $9.9 million to $15.7 million, whereas the Canadian Halifax-class annual maintenance costs are $13.6 million.[2]

Recurring Work

- An analysis of 140 CSES tasks from contract award to June 2005 found that 48 percent of the tasks (67) recurred every year, representing 67 percent of the work value ($49/$73 million). A list of the recurring tasks is provided at Annex C.

Frigate Class Nation	Annual Costs ($M Cdn)
Canada—Halifax Class	$13.6
Allied Nation A	$15.7
Allied Nation B	$12.6
Allied Nation C	$12.6
Allied Nation D	$12.2
Allied Nation E	$9.9

Table 1—International Navy Combat System Engineering Cost Comparison. *Allied nation average was $12.6 million per year, $1.0 million lower (7.9 percent) than annual Halifax-class CSES costs.*

[2] Allied CSES costs were adjusted for less complex frigates with fewer lines of code. Allied in-house personnel costs were assumed to be full costs of Canadian navy equivalents in the Cost Factors Manual. DMSS is concerned with the coarseness of the data provided by allies and has reservations regarding the CRS comparison conclusion.

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- Figure 2 shows that the cumulative escalation over the last four years has been 28 percent above the cumulated contractual rate increase of 11 percent (3 to 4 percent per year compounded over four years)—an average excess annual cost growth of 7.0 percent. FY 2001 was omitted as work was done for only nine months.

Potential Savings. Further analysis of the contract identified the following four areas where annual savings totalling $2.4 million could be achieved:

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b) Advice, etc.

a) Recurring work estimation ……..;
b) Management of core and non-core labour …….;
c) Restructure of core PY structure ……..; and
d) Introduction of a third negotiated rate …….

Recurring Work Estimation ……

- The contract provides for three different types of task pricing:
  - Level of effort (LOE)—easily amended and low risk to the vendor;
  - Fixed price—shared risk between vendor and DND; and
  - Ceiling price—low risk to DND.
- Annex D shows a breakdown of the contract's three different types of tasks (140 tasks totalling $73 million):
  - Ceiling price tasks have never been assigned;
  - 111 tasks worth $57.8 million were LOE representing 79 percent of the tasking expenditures; and
  - Only 29 tasks totalling $15.4 million were fixed price for tasks.

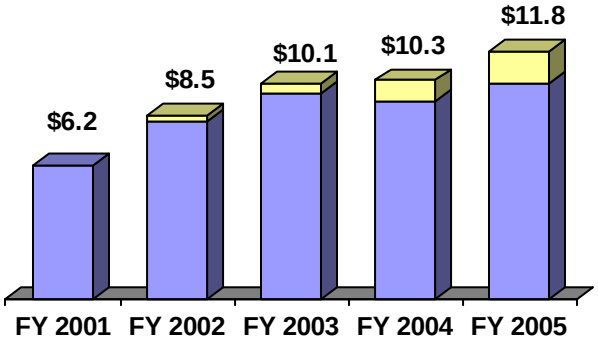

Figure 2—Annual Recurring Work ($M). *28% escalation in the last four years (in blue) in excess of the cumulated contractual 11% rate (in yellow).*

- A CRS sample of 25 tasks worth $27 million, at Annex G, compared original estimates to final costs. There were wide cost variances but, overall, the cost increase of the sample was 15 percent.

Severed under Section 20(1)(c) of the AIA Third party information

- Thirty-two of the principal annual recurring tasks, listed at Annex C, represent the core effort of 150,000 hours per year. Although the tasks recur each year, the costs per task can vary from year to year. LOE task pricing enables the transfer of money between tasks. To control the ……annual cost escalation of recurring work ……..…, the vendors' annual proposal for recurring core work estimates could be limited to the annual 4.0 percent rate increase.

Management of Core and Non-core Labour …….

- The lack of management of core vs. non-core labour has resulted in increased labour costs. The contract provides for 82.5 core PY capacity up to 150,000 hours per year. Work beyond the 150,000-hour core capacity is defined as non-core. A third negotiated rate is applied when annual hours exceed 171,600 hours. Based on FY 2005 charges the average rates for each type of labour were as follows:
  - Core rate up to 150,000 hours—….. per hour;
  - Non-core rate from 150,000 to 171,600 hours—….. per hour; and
  - Third negotiated rate for hours greater than 171,600—…… per hour.
- In the last three years of the contract, trend analysis of labour found …… …… ……
- …… …… ……
- The core PY forecast for FY 2006 was 65.7 PY—equivalent to 118,000 hours, whereas the non-core forecast was 30.5 PY—55,000 hours. …… …….
- …… ……..…… …….

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b) Advice, etc.

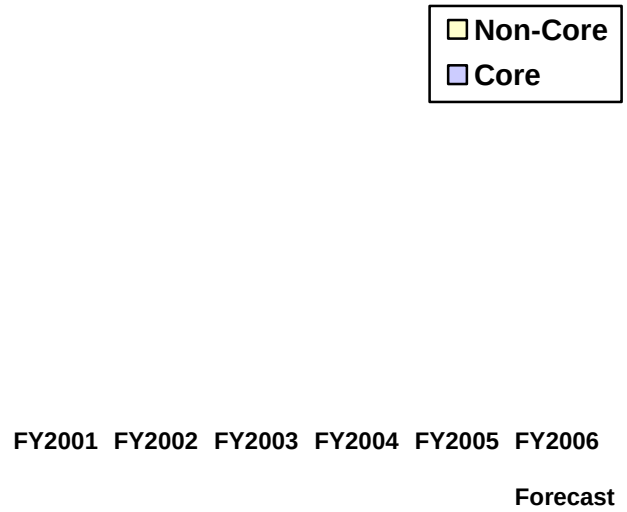

Figure 3—Labour Trend (Hours, 000). …….. ……

Restructure of Core PY Structure ……

- …… …… …… ……

- Our analysis of the core PY structure over the life of the contract at Annex F found:
  - ……
    ……
    ……
  - ……

Introduction of a Third Negotiated Rate ……..

Severed under Section 20(1)(c) of the AIA Third party information

- The introduction of the third PWGSC negotiated average hourly rate of ……. for hours exceeding 171,600 per year has increased the labour costs by $1.8 million in the CSES contract to date. Based on the FY 2005 rate adjustments, this has resulted in incremental costs of nearly …… for FY 2006 only.
- Given that this contract was competitively tendered and the value of CSES work has almost doubled from the original estimates, it is unclear why PWGSC negotiated a third rate of …… …….. without the knowledge or consent of DND.
- An analysis of the vendor's total volume of Canadian DND work in Figure 4 indicates the average rate ……... was introduced in FY 2003, …….. ……..

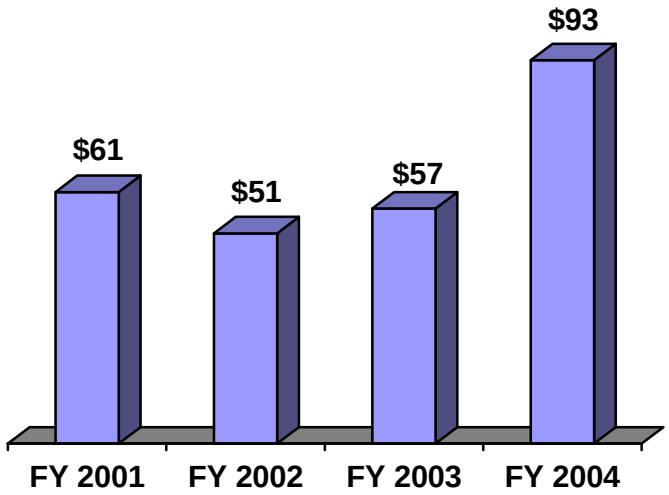

Figure 4—Payment Trend to Vendor ($M). …….. ……

Recommendations. It is recommended that Assistant Deputy Minister (Materiel) (ADM(Mat))/Director General Maritime Equipment Project Management (DGMEPM):

- Control the total costs of annual recurring work to remain within core annual rate escalations;
- Reconcile the annual 150,000 core capacity rate charges at year-end;
- Verify that the appropriate category of personnel is assigned to core work; and
- Request PWGSC to revisit the requirement for the negotiated rate in a competitively tendered contract.

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Certification of Payments

For $14.5 million of the $74 million payments examined, insufficient documentation was found to support FAA Section 34 certification. ……

Receipt of Material

- Table 2 provides a summary of the payments that did not have sufficient documentation to justify FAA Section 34 certification for payment.
- The payment sample included invoices for material totalling $7.5 million. …… ……
- Included in the $7.5 million, …… …….. ……

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b) Advice, etc.

FAA Section 34 Signatures

- Sign-offs were missing on two claims totalling $2.5 million due to training shortcomings from staff turnover in FY 2003.

Concerns Identified	Payments Value ($M)
No evidence of material receipt	……
No progress claim FAA Section 34 sign-off	……
Year-end labour surge	……
Third rate adjustment (>171,600 hours)	……
Change core labour structure	……
Unverified subcontract rates	……
Inconsistent travel expense summaries	……
Total	**$14.5**

Table 2—Unsupported FAA Section 34 Certified Payments. ……..

Year-End Labour Surge

- The vendor list of employees included core/non-core personnel that ranged from 95 to 109 individuals. …… ……... as portrayed in Annex E.
- ……. …….
- DND had not taken advantage of the contract time verification provision for core personnel employed in DND facilities.

PWGSC Negotiated Rate

- To date, the third negotiated rate charges for hours greater than 171,600 per year have resulted in incremental costs of $1.8 million. ……. …….

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Core Person Year Structure

- …… …… …… ……..
- …… …… …… ……

…… …… …… …… …….. DND did not take advantage of the contract provision for time verification of contractors' employees who work in DND facilities.

Travel Expenses

- …… …… In a $517,000 travel cost sample, expense summaries …….. ……..

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b) Advice, etc.

Subcontract Labour Invoices

- Over the first five years of the CSES contract, subcontract invoices totalled $908,000. Although the subcontract rates were to be verified by PWGSC, the contracting officer did not have copies of the five major subcontracts to verify rates.
- …… …… ……

Duplicate GST/HST Charges

- GST and HST charges were applied twice. For example, duplicate application of taxes amounted to ……. on the March 2005 progress claim.

Recommendations. It is recommended that ADM(Mat)/DGMEPM:

- Improve rigour of FAA Section 34 certification contract to address receipt of material, variance in labour billings, core PY restructure, subcontract rates/markups, tax overcharges, and travel expenses; and
- ……

Vendor Reporting

CSES contract managers did not ensure that vendor reports were completed in accordance with the contract Statement of Work and did not task the vendor to report on metrics stipulated in the contract. As a result, there was not enough information to measure the progress of the work or to quantify contractor performance.

Progress of Work Visibility

Severed under Section 20(1)(c) of the AIA Third party information

- The current reporting framework has resulted in poor visibility of the work in progress. …… …….. …….
  - …….
  - ……. …….
- The failure of the Integrated Project Management Environment (IPME) application contributed to the loss of work visibility:
  - $1.1 million was spent to develop IPME that integrated NDHQ tasks, LTDs, and the vendor time sheets; and
  - IPME was only in operation for one year then discontinued due to escalating support costs, DMSS website certification issues, and access to commercial confidential information.

Metrics Reporting

- Although the vendor was obligated to maintain 38 different Institute of Electrical and Electronics Engineers (IEEE) standard software productivity metrics, the contract managers did not task the vendor to report on these metrics. The vendor's Software Maintenance Plan, incorporated as a contract document, specified the vendor's intention of:
  - Quarterly reporting of software development and test efforts;
  - Metrics on each task at software version release; and
  - Regular System Problem Reports (SPR) with cumulative measurement data and resolution costs.
- Without metrics, the contract managers had no baseline to:
  - Validate task estimates;
  - Forecast vendor productivity; and
  - Monitor vendor cost schedule control and performance quality.

- There are five common performance metrics that are collected by allies and the private sector that are considered essential to effectively manage system integration contracts (see details at Annex H). The navy should monitor:
  - Planned versus actual costs;
  - Planned versus actual schedule;
  - Cost of new, modified, reused source lines of code (SLOC);
  - Frequency of requirement changes; and
  - Defect density per phase—SLOC per SPR.
- The absence of a performance metric baseline has made it difficult to introduce performance incentives in the follow-on CSES contract to be awarded by March 2008. There remains two years in the current CSES contract to collect metrics. A steady-state phase in the follow-on contract may be required to establish a performance baseline before contract incentives can be introduced.

Recommendations. It is recommended that ADM(Mat)/DGMEPM:

- Require the vendor to provide all reports and metrics as stipulated in the contract; and
- Analyze and validate CSES metrics in order to establish a baseline for performance incentives in the follow-on contract.

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Quality Assurance/Warranty

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CSES contract managers have not taken advantage of a 12-month design warranty that covered ……of ship command and control software version correctional work.

Design Warranty

Severed under Section 20(1)(b)(c) of the AIA Third party information

The CSES technical authority and the DMSS Detachments that oversee the development and testing of software version releases were not aware that a 12-month design warranty existed in the contract general conditions. As a result, the Department was charged for …… of correctional work that should have been covered under the warranty.

DMSS Detachments have a limited capacity to exercise this warranty. It requires the examination of programming history to determine if the prime contractor performed the defective work within 12 months of the acceptance of the work.

Contract managers were not aware of a design warranty for ship command and control systems (CCS) software that revisions could have prevented rework charges to DND.

Corrective Work

- CCS versions are driven by three types of SPRs:
  - Adaptive—interfaces required for new subsystems;
  - Perfective—new capability with existing subsystems and software; and
  - Corrective—rework of existing software to address deficiencies. Examples of corrective work are:
    - ……..
      ……
    - ……
      …….
    - ……
      ……...
    - ……
      …….
    - …….

Severed under Section 15(1) of the AIA International affairs and defence

Software Version Release	Total Software Change Cost	Corrective Change Cost	Percent Corrective Work
Halifax Class V8.0, 8.1, 8.2, 9.0	……	……	……
Iroquois Class V1.0 to 9.0	……	……	……

Severed under Section 20(1)(b)(c) of the AIA Third party information

Table 3—Ship Class Software Version Correctional Work. *Up to ……of the work done on CCS was found to be correctional.*

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- An analysis of the type of software revision work for 13 different software releases listed in Table 3 found ……. of the work was identified as corrective work worth ……..

Severed under Section 20(1)(b)(c) of the AIA Third party information

Quality Assurance Staffing

- Staffing shortfalls may have contributed to the amount of correctional work that was experienced:
  - DMSS Detachments were only 75 percent staffed;
  - Operational Requirements Analysis Cells, the navy sea trial testing cells, were only 73 percent staffed; and
  - Vendor quality assurance position at Esquimalt has been vacant for one year.
- For the most part, ship operations staffs were satisfied with the latest releases of CCS versions, and they gave an 80 percent satisfaction rating of the CCS. Tactics had been adapted with work around solutions to address any system shortcomings listed above.

Deficiencies in the navy combat system software may be attributed to a shortfall of quality assurance resources.

Recommendations. It is recommended that:

- ADM(Mat)/DGMEPM review major correctional work performed under the CSES contract that could qualify as a design warranty claim to recover costs, and assess the staffing levels of DMSS Detachments; and
- Chief of the Maritime Staff (CMS) review staffing levels of East and West coast Operational Requirements Analysis Cells.

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Material Asset Management

Material assets worth $3.0 million acquired in the CSES contract, to be utilized by the vendor, were not recorded in the Department's inventory. Contract managers failed to enforce the vendor obligation to provide semi-annual reports of hardware/software holdings and warranty claims.

- Numerous items procured under the CSES contract were not recorded in DND inventory. In total, $7.5 million of assets used by the vendor had been procured. It is acknowledged that the CFSS is unsuitable to track some inventory such as software.
- A review of CFSS accounts at each of the vendor work sites could only account for an inventory value of $4.5 million—a shortfall of $3.0 million.
- A sample of 57 hardware line items recently procured, worth $1.6 million, was compared to CFSS inventory records:
  - Only six line items worth $60,000 (four percent of the sample value) were recorded on CFSS supply accounts; and
  - The technical authority was asked to find the missing items. This request was passed to the vendor—…….

Severed under Section 21(1)(b) of the AIA Advice, etc.

At contract expiry, neither the Department nor the vendor will be able to determine the value of DND assets held by the vendor.

- The technical authority did not enforce the semi-annual vendor hardware and software reporting obligations. Reports described in the vendor Software Maintenance Plan have not been received. The reports were to include:
  - Equipment title, description, manufacturer and supplier;
  - Date of purchase, authority, cost, equipment location and use; and
  - Warranty contract number, point of contact, and expiry date.
- The absence of a vendor material warranty management system could amount to $250,000 in losses of warranty claim revenues, based on a three percent rule of thumb for warranty.

Recommendations. It is recommended that DGMEPM:

- Ensure that material procured under CSES is recorded as DND inventory; and
- Require the vendor to provide the inventory reports in accordance with the contract.

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Concentration of Authority

The number of CSES tasks managed by a single individual acting as the technical authority has contributed to a situation of excessive workload and poor segregation of duties. Approval of low value CSES tasks and their amendments by PWGSC also contributes to a concentration of authority with little added value.

Contract Management Resources

- An analysis of tasks managed by the technical authority determined that the staff structure providing contract oversight was not aligned with value of the work. In FY 2005 we observed:
  - The technical authority, one person with minor assistance from other project managers, was responsible for 43 tasks worth $9.6 million in comparison to the DMSS detachments at Halifax and Esquimalt where a total of 10 people were providing oversight of only 29 tasks worth $6.2 million; and
  - The workload of the technical authority was amplified by the failure of the IPME, an application necessary for effective task management.

One person acting as a technical authority without the assistance of a task management application resulted in excessive workload and poor segregation of duties over a five-year period.

- The excessive workload was evident upon the audit team's request for documentation. For example, the technical authority had to ask the vendor to provide supporting documentation such as task approvals, risk management plans, project management plans, and software maintenance plans.
- The technical authority was also named as the task Office of Primary Interest (OPI) for a significant portion of work. The OPI authorized work to proceed and verified the same work as completed without segregation of duties. This arrangement was in place for five years with the same technical authority assigned as the OPI for tasks totalling $24 million in value.

Recommendation. It is recommended that DGMEPM address the assignment of work to ensure balanced workload and segregation of duties.

Risk Management

Risk management practices for the CSES contract were not in place to anticipate the issues raised in this report. DGMEPM does not utilize the necessary tools and processes to adequately identify, manage and mitigate risk in large repair and overhaul contracts.

DGMEPM Risk Management

- Currently, the DGMEPM risk management emphasis is on capital projects. The audit team is concerned that risk management practices are not being implemented for at least six large navy repair and overhaul contracts that each exceed $30 million—a total obligation of $566 million.
- Only during the CSES contract tender phase did DGMEPM identify a single risk: the potential loss of contractor expertise. This risk was to be mitigated by gainfully employing the vendor personnel on lower priority tasks if necessary. There are some informal risk management practices in DMSS for budgeting and individual tasks.
- Had formal risk management practices been in place, the following issues may have been anticipated:
  - ……..
  - …….
  - Delays in software version releases; and
  - Evolved Sea Sparrow Missile (ESSM) interface $1.3 million cost overrun and two-year slippage.

The navy must develop its own risk management framework for six large repair and overhaul contracts amounting to $566 million as well as enforce vendors to comply with risk management obligations.

Severed under the AIA Sections 20(1)(c) Third party information; and 21(1)(b)(c) Advice, etc.

Vendor Risk Management

- Although the contract requires the vendor to comply with a Risk Management Plan:
  - ……
  - …….
  - …….

Recommendations. It is recommended that DGMEPM:

- Adopt risk management practices for major navy maintenance contracts; and
- Require CSES vendor to report on risks at progress review meetings and in monthly vendor status reports.

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ANNEX A—MANAGEMENT ACTION PLAN

Ser	CRS Recommendation	OPI	Management Action	Target Date
1.	**Cost Escalation.** Control the total costs of annual recurring work to remain within core annual rate escalations, reconcile the annual 150,000 core capacity rate charges at year-end, verify that the appropriate category of personnel is assigned to core work, and request PWGSC to revisit the requirement for a negotiated third rate in a competitively tendered contract.	ADM(Mat)/ DGMEPM/ DMMS	Total costs of the annual recurring tasks at Annex C will be monitored to control annual cost escalation of core work. Agreement has been reached with the vendor to manage as closely as possible the approval of 150,000 hours of core tasks first before approving non-core tasks. The follow-on CSES contract will not have a non-core rate. Task directives will be closely scrutinized to ensure the appropriate category of personnel is assigned to core work. The third negotiated rate will be discontinued in the follow-on contract.	Jan 07 Actioned Oct 06 Apr 08 Actioned Oct 06 Apr 08
2.	**Certification of Payments.** Improve rigour of FAA Section 34 certification in the CSES contract to address receipt of material, variance in labour billings, core PY restructure, subcontract rates/markups, tax overcharges, and travel expenses. ……	ADM(Mat)/ DGMEPM/ DMMS	FAA Section 34 training has been provided to CSES contract managers. The receipt and visibility of material will improve with loan agreement clauses in the follow-on contract Agreement has been reached with the vendor for the need to rebalance the core PY structure with the requisite training. The contract's time verification provision for vendor personnel employed in DND facilities will be investigated. ……	Actioned Oct 06 Apr 08 Actioned Oct 06 Mar 07 Mar 07
3.	**Vendor Reporting.** Require the vendor to provide all reports and metrics stipulated in the contract. Analyze and validate CSES metrics in order to establish a baseline for performance incentives in the follow-on contract.	ADM(Mat)/ DGMEPM/ DMSS	Monthly progress reports will be required from the vendor in accordance with the contract. The vendor will be tasked to report on metrics that have been recorded since 2003 in order to establish benchmarks and trends for the follow-on CSES contract.	Actioned Oct 06 Mar 07

Severed under Section 21(1)(c) of the AIA Advice, etc.

Severed under Section 21(1)(c) of the AIA Advice, etc.

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ANNEX A

Ser	CRS Recommendation	OPI	Management Action	Target Date
4.	**Quality Assurance/Warranty.** Review major correctional work performed under the CSES contract that could qualify as a design warranty claim to recover costs. Review staffing levels of East and West Coast ORACs and DMSS Detachments.	ADM(Mat)/ DGMEPM/ DMSS CMS	Given the limited capability to trace the historical cause of system defects, the warranty will be exercised only in clear cases of defective work done by the prime contractor within the 12- month warranty period. The DMSS detachment vacancy has been temporarily filled and should be permanently filled before Dec 06. CMS to liaise with appropriate CMP staff to address manning shortfalls in MARLANT/MARPAC ORAC positions.	In progress Actioned Oct 06 Mar 07
5.	**Material Asset Management.** Ensure that all material procured under CSES is recorded as DND inventory. Require the vendor to provide the inventory reports in accordance with the contract.	ADM(Mat)/ DGMEPM/ DMSS	DMSS detachment are now recording the receipt of inventory utilized by the vendor. The vendor is now providing regular reports of government furnished equipment.	Actioned Oct 06
6.	**Concentration of Authority.** Address the assignment of work to ensure balanced workload and adequate segregation of duties.	ADM(Mat)/ DGMEPM/ DMSS	Duties have now been segregated between the CSES design authority, program manager, and technical authority.	Actioned Oct 06
7.	**Risk Management.** Adopt risk management practices for major navy maintenance contracts. Require CSES vendor to report on risks at progress review meetings and in monthly vendor status reports.	ADM(Mat)/ DGMEPM/ DMSS	Informal risk management practices are already in place in the CSES contract. Improved risk management plans will be developed for major navy life cycle support contracts. The vendor will be requested to report on risks and mitigation strategies.	Actioned Oct 06 Apr 08 Mar 07

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ANNEX B—SUMMARY OF CRITERIA

Severed under the AIA
Sections 20(1)(b)(c)
Third party information; and
21(1)(b)
Advice, etc.

Criteria	Rating	Justification
Risk Management Framework		
Risks understood and appropriately managed.		No vendor risk reporting. No risk management plan for contracts >$30M.
Crown indemnification and contractor insurance.		Indemnification clause only, no insurance coverage for 3rd party claims.
Contract provisions for termination in place.		Compliant.
Warranty provisions reduce risk to the Crown.		…… corrective work. Tech authority not aware of 12-month warranty.
Vendor performance measurement system in place.		IEEE metrics not reported. No measurement of cost/schedule performance.
Contract dispute resolution provisions in place.		Compliant.
Management Control Framework		
Roles and responsibilities are clear.		Approval of all tasks by PWGSC not IAW contract.
Contract management staff trg, experience, workload.		25% manning shortfall in DMSS Dets and ORACs. Loss of IPME.
Oversight exists to monitor value for money.		Recurring task cost escalation of 5.2% per year. CSES higher than allies.
Reasonable balance between risk and controls.		Task approval threshold $75K provides PWGSC 95% visibility of all work.
Procured/loaned material safeguarded/accounted for.		……..
Payments are IAW FAA, TB, PWGSC regulations.		…….
Flow down of contract terms to subcontractors.		…….
Contractor meets operational requirements.		……..
Statement of work describes op requirements.		NDHQ LTDs do not provide specific cost breakdown of taskings.
Contract addresses national security risks.		Contract security requirements are adequate.
Optimum basis of payment.		Fixed time rate is high risk. 67% CSES work recurring level of effort pricing.
Shared set of values and ethics.		Same TA for five years. No segregation of duties for OPI work—$24M.
Information for Decision Making		
Appropriate monitoring/reporting strategies in place.		……..
Decision-making information is reliable.		STS integrity; IPME discontinued; TATD/LTDs authorizations not retained.

Satisfactory Needs Minor Improvement Needs Moderate Improvement

Needs Significant Improvement Unsatisfactory

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ANNEX C—ANNUAL RECURRING CSES TASKS

TA TD	TITLE	Months	Total Hrs	PYs	Payments
0603	Implement Software Change (Halifax)	60	76,416.20	8	$4,036,179.13
0004	Combat System Technical Support to LCMMs	60	38,424.70	4	$3,537,275.89
0803	Implement Software Change (Iroquois)	60	53,951.30	6	$3,072,381.63
0006	Procurement of Equipment and Material under CSES	53	36.00	0	$3,071,532.16
0608	PGC/IT/IPSE Support (Halifax)	60	50,079.50	6	$2,648,498.22
0402	General Program Support	37	34,229.15	6	$2,089,900.56
0003	Miscellaneous Technical Support Services	60	26,817.80	3	$1,968,968.48
0601	Conduct Technical Investigations (Halifax)	60	32,844.55	4	$1,703,025.03
0607	CM/DM/Library Support	60	34,074.85	4	$1,688,465.88
0500	Miscellaneous Software Support Services	57	20,336.90	2	$1,332,230.15
0208	LCMM/TI Support to NEWC	41	13,943.70	2	$1,264,486.49
0606	Material	60	9.50	0	$1,261,704.70
0002	Conduct Systems Technical Investigation and Studies	60	15,771.55	2	$1,182,160.56
0401	General Program Support	22	18,210.60	6	$1,129,690.53
0032	SASIE Support & SOW	40	10,923.80	2	$1,120,286.29
0610	Facility Overhead and DND-mandated activities (Halifax)	60	20,246.10	2	$1,109,132.50
0602	Conduct Impact Analyses (Halifax)	60	18,600.50	2	$994,064.03
0807	CM/DM/Library Support	60	17,444.50	2	$906,566.98
0804	Test, Trial and Evaluation Support	60	13,939.80	2	$897,991.78
0811	SSS Support	43	15,582.00	2	$859,426.54
0806	Material	59	0.00	0	$799,277.54
0614	Tech Support and Eng Services, Including CSTC SIM	56	14,198.30	2	$792,242.19
0501	CSES Software Maintenance	36	12,613.65	2	$762,672.35
0023	Naval Electronic Warfare Centre Suport	30	8,787.30	2	$750,142.91
0403	General Program Technical Support	15	8,636.50	4	$709,062.57
0027	DMSS 8 Website Support	27	0.00	0	$641,341.66
0613	GCCS-M Support	58	7,731.90	1	$606,201.68
0808	Facility System Support (Iroquois)	60	12,315.50	1	$602,489.02
0605	Version Planning & Release	60	10,522.40	1	$584,478.47
0805	Version Planning & Release	60	8,654.00	1	$547,665.36
0042	Human Factors	27	7,109.60	2	$545,465.56
0810	Facility Overhead and DND-mandated activities (Iroquois)	60	8,522.65	1	$523,323.69
			610,974.80	82	$43,738,330.53

The list of 32 tasks is the accumulated work from July 2000 to June 2005. Only those with expenditures greater than $500K are included.

PY estimates were based on 150 hours of labour per month.

Note that these recurring tasks account for 82 PY, which almost consumes the core labour capacity—147,600 of 150,000 hours.

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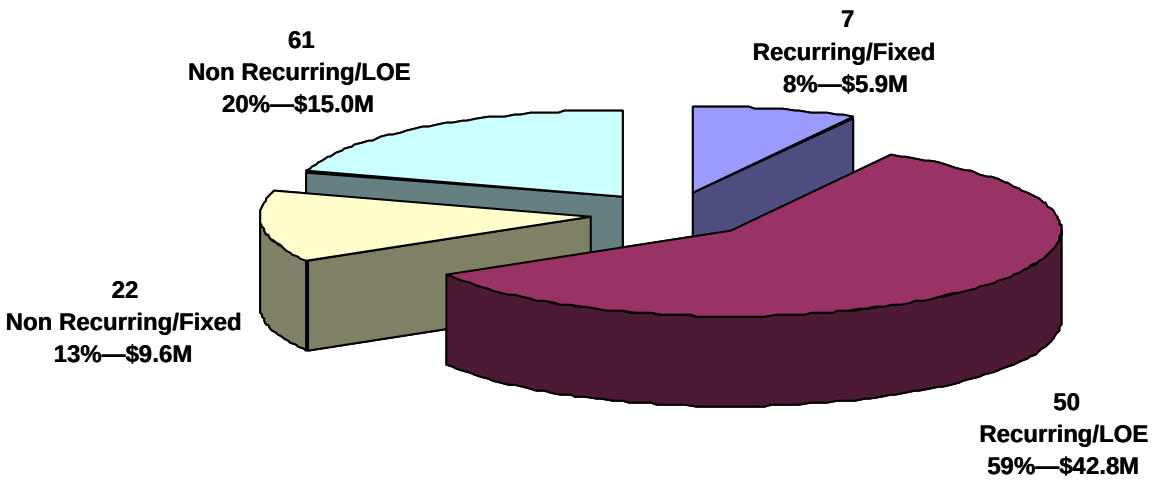
ANNEX D—TYPE OF CSES DND 626 TASKINGS

140 CESES Tasks—$73M
July 2000 – June 2005



Although the CSES contract also provided for ceiling price tasks, only fixed price and LOE tasks were utilized.

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ANNEX E—MONTHLY FLUCTUATION OF CORE AND NON-CORE PERSONNEL

Severed under Section 20(1)(c) of the AIA Third party information

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ANNEX F—CORE PERSON YEAR TREND

Severed under Section 20(1)(c) of the AIA Third party information

Personnel Category PY Structure		LabourHours FY2002-PY Equivalents		LabourHours FY2003-PY Equivalents		LabourHours FY2004-PY Equivalents		LabourHours FY2005-PY Equivalents		LabourHours FY2006-PY Equivalents	
……	…...	1,585.00	**0.9**	1,128.50	**0.6**	927.00	**0.5**	6,129.50	**3.4**	1,752.50	**3.9**
……	…...	33,654.50	**18.7**	28,856.30	**16.0**	22,680.80	**12.6**	6,684.65	**3.7**	1,125.90	**2.5**
……	…...	54,102.80	**30.1**	57,981.00	**32.2**	51,575.60	**28.7**	59,825.15	**33.2**	11,713.10	**26.0**
……	…...	9,525.90	**5.3**	10,350.30	**5.8**	10,117.10	**5.6**	13,281.20	**7.4**	1,918.50	**4.3**
……	…...	7,451.00	**4.1**	10,539.60	**5.9**	10,213.60	**5.7**	15,140.60	**8.4**	2,738.50	**6.1**
……	…...	5,166.00	**2.9**	4,770.60	**2.7**	6,357.30	**3.5**	8,589.10	**4.8**	1,671.25	**3.7**
……	…...	0.00	**0.0**	0.00	**0.0**	0.00	**0.0**	0.00	**0.0**	151.00	**0.3**
……	…...	20,213.90	**11.2**	26,327.00	**14.6**	22,972.60	**12.8**	19,627.05	**10.9**	4,542.90	**10.1**
……	…...	17,875.20	**9.9**	20,675.50	**11.5**	12,887.80	**7.2**	7,973.15	**4.4**	1,149.50	**2.6**
……	…...	8,497.60	**4.7**	4,986.20	**2.8**	3,099.00	**1.7**	1,175.00	**0.7**	209.50	**0.5**
……	…...	158,071.90	**87.8**	165,615.00	**92.0**	140,830.80	**78.2**	138,425.40	**76.9**	26,972.65	**59.9**

Based on the core labour hours reported in the vendor monthly status reports, the number of equivalent core PYs was calculated. The PY equivalents for each category were compared to the PY structure specified in the contract up to May 2004. The highlighted categories are significantly different from the original PY structure.

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ANNEX G—CRS SAMPLE OF CSES TASKS

TATD	Task Description	Forecast (K)	Actual (K)	% Delta	Comment
0001	Support to SOW preparation	$ 524	$ 362	-31%	High year 1 cash-outflow leading to high forecasted amounts
0002	Conduct Systems Technical Investigation & Studies	$ 836	$ 1,077	29%	Overspent
0003	Miscellaneous Technical Support Services	$ 1,732	$ 2,098	21%	Increasing cash outflows over time—greater than expected
0004	Combat System Technical Support to LCMMs	$ 3,844	$ 3,240	-16%	Under spent
0006	Procurement of Equipment and Material under CSES	$ 2,068	$ 1,678	-19%	Under spent
0007	Complete AHWCS Integration Phase 1A	$ 285	$ 262	-8%	Slightly under spent
0009	ESSM Integration to the Halifax Class Frigates	$ 90	$ 762	747%	Lack of info—poor orig. est. of $90K
0012	Support of AHWCS Integration - HIS	$ 717	$ 732	2%	Milestone Procurement task—Authorized amount amended from original
0020	HAL/IRO Class Combat Systems Integration Working Gp	$ 210	$ 179	-15%	Under spent
0023	Naval Electronic Warfare Center Support	$ 624	$ 641	3%	Slightly overspent
0027	DMSS 8 Website Support (HUB Computer)	$ 94	$ 673	616%	8 month delay—High cost overrun—IPME application not working
0030	Single Board Node(SBN) Procurement - FFP	$ 590	$ 590	0%	Milestone Procurement task—Spent equal to Milestone
0032	SASIE Support & SOW	$ 663	$ 1,100	66%	Quickly increasing cash outflows over time—greater than expected
0050	ESSM related Combat Systems Trainers Upgrade	$ 70	$ 36	-49%	Highly under spent—linked to 211
0055	Purchase and STW Telelogic DOORS	$ 437	$ 289	-34%	Milestone Procurement task—Highly under spent
0203	COMDAT 1 - AAW MSDF	$ 275	$ 272	-1%	Slightly under spent—lack of information on progress
0206	Support of AHWCS Integration - Kanata/Montreal Lab	$ 2,191	$ 2,340	7%	Slightly overspent—Authorized amount amended slightly from original
0207	COMDAT I Cycle II Technology Demonstrator	$ 1,236	$ 1,299	5%	Slightly overspent (3 budget amend.) 18 months delay
0208	LCMM/TI Support to NEWC	$ 948	$ 1,181	25%	Overspent
0211	VLESSM	$ 3,000	$ 4,308	44%	Cost overrun of $1.3M+ Sched. Slippage of 2+ years and still going
0237	CCS 330 Systems Specification	$ 405	$ 1,417	250%	Quickly increasing cash outflows over time—greater than expected
0401	General Program Support	$ 1,087	$ 921	-15%	Under spent
0402	General Program Support	$ 1,614	$ 1,242	-23%	Under spent
0500	Miscellaneous Software Support Services	$ 792	$ 1,285	62%	Quickly increasing cash outflows over time—greater than expected
0501	CSES Software Maintenance	$ 594	$ 655	10%	Overspent
		$ 24,926	**$ 28,639**	**15%**	

TATDs in light green are lower-risk recurring tasks, while the others are higher-risk non-recurring tasks. ……
……
……

Severed under Section 20(1)(c) of the AIA Third party information

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ANNEX H—COMMON METRICS USED BY INDUSTRY AND ALLIES

Description of Metric	GAO 04-393[3]	Cutter 2005[4]	Software[5] Support	GSAM v.3.0	GTAG IIA[6]	GSAM Engr Appdx	IEEE
Cost and effort per phase/phase duration.	X	X					
Planned vs. actual cost/Cost Performance Index (CPI).	X	X	X	X		X	
Financial/staffing report.						X	
Planned vs. actual delivery dates/Schedule Performance Index (SPI).	X	X	X	X	X	X	
Percent of project on time.	X					X	
Percent of time spent on unplanned work.					X		
Amount of new, modified, and reused Source Lines of Code (SLOC)/pages.	X	X		X			X
Size estimation accuracy.	X						
Size trend report (delivered SLOC).						X	
Productivity (size/effort) or staff-hours per activity.				X		X	X
Effort (SLOC per month of effort).				X			
Target system resource usage report.						X	
Total requirement or features committed to deliver, needs or requirements by phase.	X	X		X			
Percent of requirements completed.	X						
Frequency of requirement changes (requirement changes per week).		X		X	X	X	X
Number of tests planned, completed, and passed or test needed to cover the design.	X			X			
Number of defects and errors per phase (defect density tracking report)/SLOC per SPR.	X	X	X	X		X	
Phase defect originated vs. phase found, post release defects.	X	X					
Cost to fix defect or SPRs cost of poor quality (rework).	X	X					X
Severity of defect, categorized SW defects (serious, important).	X	X					
Total unresolved defects, completed defects, SPR status report.	X					X	

Highlighted rows are the most common metrics used by allies and the private sector.

[3] US Government Accounting Office Report – Defence Acquisitions of Software Intensive Weapons March 2004.
[4] Cutter, Benchmark Review – Enabling Decision – Making Agility March 2005.
[5] SW Product Support and Maintenance Outsourcing, Goldstone Technologies 2002.
[6] Global Technology Audit Guide, International Institute of Auditors.