CONTRACT TASK ORDER #5 FINAL REPORT

FOR THE

SCIENCE and ENGINEERING TECHNICAL ASSESSMENTS (SETA) PROGRAM

CONTRACT NUMBER: NAS2-98028
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October 18, 1998 to May 10, 1999

Prepared for:

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Foreword

This report documents the activities performed by the SETA contractor for Contract Task Order #5 over the period of performance starting October 18, 1998 to May 10, 1999.

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1   Contract Task Order #5 – Office of Safety and Mission Assurance (OSMA) Software Program

1.1   Program Management

In order to begin the allocation of resources for Contract Task Order 5 (CTO#5), a number of meetings and teleconferences were held with D.N. American contract personnel and the Contracting Officer's Technical Representative (COTR). Once a clear understanding of the task statement of requirements was achieved, resources were assigned for prime and subcontractor personnel at the appropriate skill levels.

The SETA Program Manager (PM) worked with D.N. American contract personnel and the System Engineering Division Chief to establish estimates of the skills and hours necessary to successfully execute CTO#5. The PM generated the estimates, assigned them to appropriate companies (prime and subcontractor) and developed subcontractor task orders. Further meetings were held with D.N. American contract personnel and subcontractors to insure that appropriate personnel would be available or hired. A final adjustment to the labor hours assignments was done after a meeting with the COTR indicated a reduction in the requirements onCTO #5.

During CTO#5, Mr. Josiah Devasirvatham replaced the SETA Program Manager (PM) on an interim basis. Mr. Devasirvatham attended meetings with the IV&V Facility Chief and various NASA Civil Servants to determine the new direction for the SETA program. During these meetings, the IV&V Facility Chief instructed SETA to redirect the scope of their work from "administrative" support to technical, systems engineering, and software engineering analysis support. In response to the redirection, changes were made to reassign administrative personnel by evaluating their capabilities for providing technical and analytical support. One position was deleted from the SETA team, due to its purely administrative nature. All other personnel have shown moderate capabilities to provide the new technical services.

The SETA PM was tasked with proposing new activities and approaches to SETA's current tasking structure. The SETA PM, therefore, documented (in a proposal) the anticipated role of SETA during option year one. The proposal, titled "Change of Focus," which addressed what type of technical services SETA would perform, how it would perform those activities, resources to support the activities, and an estimated cost was completed and submitted to the IV&V Facility Chief and the COTR. This proposal systematically addresses all of the requirements requested by the Independent Verification and Validation (IV&V) Facility Chief over the past two months.

During the management of CTO#5 the SETA PM performed or facilitated the necessary duties of:
- Held discussions with individual SETA personnel on a frequent basis to track performance, provide advice or decisions. Also held weekly team meetings.
- Communicated with subcontractors, the COTR and D.N. American contracts personnel to ensure the efficient functioning of team.
- Managed and tracked SETA resources expended on CTO#5 to ensure SETA stayed within budget allocations.

- Provided direction, guidance, and decisions on tasking, limits of tasks, and prioritization of tasks to team members.
- Provided technical direction in daily work and producing deliverables. Also reviewed all draft and final versions of CTO#5 deliverables and products.
- Held meetings between D.N. American contracts and System Engineering Division Chief to analyze follow-on for CTO#5.
- Identified the skills and hours necessary to perform follow-on work, assigned these to appropriate companies (prime and subcontractor) and developed subcontractor task orders.
- Communicated customer feedback to the team.
- Notified subcontractors of the additional requirements in order to facilitate the active pursuit of more technically capable team members in the areas of software safety, software quality assurance and cutting edge software engineering knowledge.
- Prepared and submitted justifications for all OSMA-funded SETA work.

Determining the direction necessary for the Science Application International Corporation's (SAIC) involvement with the SETA contract was one of the primary focus areas this reporting period. The COTR and other appropriate representatives have been kept abreast of the latest activity by SAIC in regards to the Non-Disclosure Agreement (NDA) and their requirement of charging computer usage rates directly to the customer. A detailed memorandum was sent to SAIC describing the current conditions and restrictions of the SETA contract and their part within it. The SAIC NDA issue reached an internal agreement stage within the IV&V Facility and Ames Research Center (ARC). The NDA was forwarded by D.N. American to SAIC once signatures were gathered from the participants for the Risk Evaluation Methodology Workshop (to be hosted by SAIC).

It is planned for the attendees to the Workshop to be:
- Cynthia Calhoun from the IV&V Facility;
- Siamak Yassini from the IV&V Facility;
- Josiah Devasirvatham from D.N. American; and
- Michael Fotta from D.N. American

SAIC, after receiving and reviewing the signed NDA, identified additional requirements that they felt must be addressed prior to the approval of the NDA from their management. D.N. American requested the additional requirements from SAIC and forwarded them, within a revised NDA, to the NASA IV&V Facility. The NASA IV&V management, with support from ARC, refused to accept the additional requirements levied by SAIC and decided to drop the entire issue. This resulted in a judgement by the IV&V management that SAIC would no longer be required to perform Independent Software Assessment activities. SAIC was notified of this result and have accepted the judgement, although regretfully.

1.2   Product Review

Analyzed the West Virginia University Software Reliability Estimation Report and recommended the IV&V Facility convene a Software Reliability Panel to address the true need

for this effort and evaluate existing tools and methodologies that current support reliability estimation.

Performed an informal assessment of the portion dedicated to Code IT within the Code I CD-ROM prepared by ARC.

1.3   Year 2000 (Y2K) Compliance

The SETA team produced a Y2K Compliance Program Plan. The plan identifies the process the SETA team will undergo to definitively document and show the IV&V Facility compliance to their Y2K requirements. The plan was reviewed, approved, implemented on the program. The IV&V Facility Network personnel evaluated SETA's hardware and software in accordance with IV&V Facility policies and the SETA Y2K Compliance Plan. The environment was approved as Y2K compliant. All SETA technology was approved, however, the HyperNews tool was not approved, used by the Software Working Group Information Exchange (SWGIE) web site. HyperNews did not show clear evidence that it was Y2K compliant and the IV&V Facility Network staff was unable to acquire appropriate documentation from the developers. It was, therefore, the recommendation of the NASA IV&V Facility Network Operations personnel that the HyperNews tool be replaced with one that does pass the Y2K compliance tests.

All new or updated equipment (hardware and software) purchased or given to SETA was presented to the IV&V Facility Network Staff for Y2K compliance evaluation. All equipment passed.

SETA member companies reviewed, on a monthly basis, all new or updated equipment (hardware and software) purchased or given to SETA to ensure its Y2K compliance. The IV&V Facility Network Operations personnel tested new equipment prior to activating it on the network.

1.4   Documentation Assessment

SETA performed an in-depth assessment of the OSMA Level 1 Technical Program Plan, which included providing:

- Recommendations of how to integrate the research efforts of the Intelligent Systems (IS) and Intelligent Synthesis Environment (ISE) initiatives into the plan.
- A description of SETA's new role and responsibilities in regards to OSMA for inclusion in the plan.
- Recommendations on how to get technical penetration into the Center Initiatives (CIs).

Furthermore, SETA provided system and software technical analysis on several NASA documents as requested by the NASA staff. These include:

- Analyzed the Jet Propulsion Laboratory's (JPL's) "Applying Integrated Safety Analysis Techniques" report and recommended that the IV&V Facility not accept the document due to a lack of technical clarity and meeting the requirements of the CI.
- Reviewed and commented on two CI proposals submitted by Howard Kea of the Goddard Space Flight Center (GSFC). The proposals were titled "Developing a List of

Core Software Measures" and "Developing Code Q Training Courses". Comments were provided to the OSMA Delegated Program Manager (DPM).

- Reviewed the Strategic Plan and provided editorial comments.
- Supported the creation and formatting of the organizational charts for implementing the Strategic Plan, operational illustrations, slide presentations and other graphics included in the Strategic Plan.
- Attended and took detailed minutes of the Aviation Safety Advisory Panel's (ASAP) all day visit to the IV&V Facility on November 4, 1998.
- Assisted in the documentation of the Center Implementation Plan.
- Supported the creation of a Concept of Operations (ConOps) whitepaper and accompanying slide presentation for a proposed Metrics Organization to be based out of the IV&V Facility through technical inputs, editing and expanding on ideas presented by the OSMA DPM.
- Completed the Domain Analysis Guidebook Assessment Report and provided it to the DPM and SETA COTR on February 18, 1999. The Guidebook analysis was not accepted by the IV&V Facility and SETA was asked to redo the analysis. The SETA PM assigned the task to a software reuse domain expert who reviewed the guidebook and essentially agreed with the original analysis. Since the customer was not comfortable with the original analysis for its technical content the SETA PM chose to complete the analysis. However, due to other priorities the analysis has been postponed.
- Assessed articles prepared for potential submission to the ARC Research and Technology (R&T) Report. Prepared and presented recommendations on which articles should be sent, in article format, to Ames. To this end, SETA personnel attended various meetings with Facility and Research management in order to develop seven informative summaries of the R&T article choices so that IV&V Facility management could make final selections.
- Met with NASA contact to prepare an informal assessment of SETA's role in preparing the 1998 Annual Report.
- Analyzed the National Institute of Standards and Testing (NIST) Collaborative Research Proposal and recommended adding substance in the proposal areas of deliverables, dates, period of performance, resources, etc.
- Attended a meeting with the SETA COTR and the Technical Lead of the Langley 757 Assessment effort to resolve issues that arose from the Langley 757 Assessment. The SETA PM provided a memo to the SETA COTR and the Assessments Technical Point of Contact that identified ways to improve future IAs and the resulting documentation.
- Attended the planning and dry run of all presentations intended for Paul Kutler's visit to the IV&V Facility on March 18, 1999.
- Completed an assessment of bi-monthly General Management Review (GMR). Included the creation of a completely new, detailed reporting template, outlining the elements of effective risk reporting and identifying weaknesses and inconsistencies in the current reporting process.
- Assisted in preparation of OSMA Software Assurance Program Operating Plan for FY99.

1.5   Business Process and Facilitation

Finalized the Acquisition Forecast Report that captures information on all NASA Safety Critical Software contracts with budgets over $10 million over the next two years on January 8, 1999. Within the document each contract is further identified by Enterprise penetration, start and completion dates, history, program managers, and measures of accomplishments.

Participated in a meeting with the SETA COTR, the NASA Lead for the Checkout Launch and Control System (CLCS) Program, as well as the CLCS contractor (Averstar) to discuss performing an Independent Assessment (IA) on issues surrounding the CLCS IV&V Program. At the conclusion of the meeting, SETA informed the NASA representatives as to whom would be involved in performing the IA. However, the IA work did not come to fruition as the NASA Lead for the CLCS Program decided not to perform an IA. The SETA COTR informed SETA of this decision.

SETA provided comments to the IV&V Facility Director on the Tom Thornton Presentation. Tom Thornton is the Chief Information Officer (CIO) at thJPL. He made this presentation at the Software Working Group (SWG) Face to Face meeting in February and a copy of the presentation was provided to the Facility Director via the SWG Chair. The purpose was to identify potential collaborations with the JPL CIO efforts and similarities to IV&V efforts.

Began preparing for the Senior Management and Center Director's meeting scheduled to take place at the IV&V Facility June 23-25, 1999. SETA is exploring ways to effectively present the capabilities of the IV&V Facility as well as providing technical support to the IV&V Facility in preparation of the presentation.

Attended the IV&V Facility all-hands meeting of March 3, 1999, and followed up the discussion with research in the realms of IS and ISE. Gathered information from the web and other sources and provided the results of the search to the Research Lead and the IV&V Facility Chief for inclusion into the OSMA Level 1 Technical Program Plan and future presentations.

1.6   OSMA Software Management and Annual Review Facilitation

SETA completed the second draft of the OSMA Software Assurance Level 2 Consolidated Plan for FY2000. The Level 2 Plan was delivered on December 18, 1998. The IV&V Facility Deputy Chief identified areas to expand upon, and a third version of the document was required. The new contents of the plan are as follows:

- A Level 2 schedule;
- Reorganized FY2000 priorities and, where available, FY2001; and
- Reorganized structure to include the NASA IV&V Facility Strategic Plan.

SETA personnel gathered and edited data, from each of the civil servants, for compilation into Bi-Monthly General Management Review (GMR) Presentations for December 1998 and February 1999. Also supported the teleconferences for each GMR Presentation.

Created an OSMA GMR Process flow chart and made requested changes to the GMR presentation. This included developing matrixes for tracking non-conformities and

recommended actions, and adding the DNV ISO Certification logo. Prepared a GMR Status Report slide presentation for the Facility Chief's perusal. Gathered and edited data from each of the civil servants for compilation into the February Bi-Monthly GMR Presentation. Compiled a historical tracking of IV&V Facility GMRs dating back to FY96 that will be used for archival purposes.

Coordinated with Network staff to get Software Engineering Evaluation System (SEES) documentation placed on a drive to be available for NASA staff.

SETA began the effort to completely reedit the OSMA Level 1 Program Plan as well as the Technical Plan earlier in the reporting period. However, the assignment to complete the OSMA Level 1 Program Plan was redirected by the IV&V Facility Chief to perform a detailed document analysis. SETA, therefore, submitted the Level 1 Plan to the OSMA DPM as is and provided detailed comments on improvements (See Section 1.1.2).

SETA personnel began the exercise of reconciling the OSMA Level 2 Plans. SETA is consolidating the FY2000 Level 2 Plans from each of the centers into a "strawman" template that will be presented to the SWG at the February Face to Face meeting in preparation for the FY2001 planning. SETA personnel will continue to meet with the IV&V DPM of the OSMA program to refine the template.

Members of the SETA team attended a Program Management Review (PMR) on November 11, 1998 related to research on return on investment metrics. Based upon this PMR, and others that the SETA team has attended, the PMR reporting template was updated in accordance with the suggestions of the IV&V Facility Chief.

SETA personnel completed a draft annual abstract for the *Integrating Software and System Safety Techniques* and *Safety Critical Product Family Development* CIs. The abstracts were delivered to the OSMA DPM for incorporation into the IV&V Facility Annual Report. Identify, tracked, compiled and gathered products from previous years' CIs. Documents and products, from the previous CIs, were placed in the SETA project archive. To this end, compiled a list of CI Deliverables for determining which products need to be added or deleted from the IV&V Facility Web Page.

Slides of the OSMA CIs were developed for inclusion into the ASAP presentation at the IV&V Facility.

In order to discuss the development of documents, status of center initiatives, and future work for the OSMA Program, SETA personnel participated in weekly meetings with the OSMA DPM. Corresponded with the CI Technical Point of Contact (TPOC) to coordinate completion of the CI Proposals, ensure format, gather missing information, etc. Furthermore, SETA developed an OSMA Program forecasted budget matrix for the DPM.

Participated in informal monthly reviews with the CI TPOCs, DPM, and technical lead. Upon completion of the meetings, circulated project summaries to the proper people for filing. SETA

provided technical questions on each CI and captured the status of CI deliverables for updating the CIM tool (see section 1.1.5 for additional details).

1.6.1 *Center Initiative Management (CIM)*

Established a structured method for the management of CIs and began monthly telephone conferences with each CI TPOC. Each TPOC is asked to report CI content, progress, and any financial or technical issues. These telephone conferences will continue every month and information will be updated within the Center Initiative Management (CIM) tool as necessary. The CIM Tool was updated to reflect the approved list of CI Managers, TPOCS, budget, and personnel for the FY99 CIs. All CIs have been received and approved by both the OSMA DPM and the IV&V Facility Director.

SETA personnel updated and finalized this year's CI Deliverables list and schedule. This included inputting the final data into the CIM Tool and updating previously constructed deliverable schedules.

SETA personnel finalized and delivered the OSMA Software Assurance Program Operating Plan to the DPM on November 30, 1998.

SETA completed a preliminary review of the center initiative Quest Enabling Software Toolkit (QUEST) documentation and an assessment of the tool. The analysis involved the following:

- Executed the QUEST Toolkit using the clock project included as a part of the tutorial.
- Executed Anomaly Detection that involves static analysis of the source code.
- Executed Code Dependence Analysis that provides Control Flow Graphs (CFGs) and static analysis of program dependencies including: data dependencies and control dependencies.
- Executed the toolkit for the Data Flow Analysis that uses Flow Analysis for Verification of Software (FLAVERS) to define the set of program properties that will always or never occur.
- Encountered difficulties verifying the testing capabilities of the QUEST Toolkit. This requires instrumenting the code and then recompiling. There is no Ada compiler present with the current toolkit. This issue was raised with the Network Staff and the QUEST CI Manager. Network Staff is downloading the GCC compiler that can be used. The Rational Spire compiler, recommended by the developers, will not be used.
- Received email from NASA POC regarding ADA GNAT compiler - installation of the compiler may cause problems with the current version of the QUEST Tool Set.
- Performed research online for information on various toolset components. Information was obtained and reviewed on the Arcadia project, Pleiades Object Management System, ProDag, TAOS, and FLAVERS. These are the primary components of the QUEST Tool Set.
- Reviewed the MCC Technical Report on the State of Research in Quest Technology and began preparing various high-level testing schemes to validate the QUEST Tool Set's perceived functions.
- Attended QUEST Tool Set demonstration and training session to review and provide comments on what has been identified so far with the QUEST Tool Set Assessment.

- Scheduled follow-up meeting with the NASA POC to discuss setting up interviews with Averstar group participants to gather feedback on the usability and future of the Quest Tool Set. However, Averstar provided feedback and input to the NASA POC via an evaluation form. Copies of these forms were obtained from the NASA POC and interviews were not needed.
- Attended a one-day demonstration/training session on the McCabe Software in order to evaluate the completeness and usefulness of similar functions that are performed by the QUEST Tool Set.

1.6.2 *Software Working Group*

In support of the SWG SETA performed the following activities:

- Completed an analysis report regarding the SWG and the involvement of the IV&V Facility in the SWG.
- Compiled all Training information available through the SWG into a matrix and course listing. Training from sources within and without NASA are represented. To determine the template for presenting this data, SETA worked closely with the Training Subgroup. The template evolved through several draft versions according to the comments and requirements of the Training Subgroup.
- Collected Action Item (AI) results from members of the SWG Training Subgroup and incorporated these into the SWG Training Subgroup Course Listing and Matrix. Added new course info as gathered from course providers and presented the finished product to the SWG chair.
- Worked on a draft compilation of all training information presently available through the SWG into a matrix and course listing.
- Coordinated with all participating parties for the development of the February 1999 SWG Face to Face Agenda.
- Participated in the SWG Face to Face at JPL. The purpose of the trip was twofold. First, SETA was to provide technical assistance to the SWG Chair at the meeting and determine what role SETA could potentially participate in the SWG. Second, SETA was to conduct an analysis of the SWG meetings and provide the Director of the ARC/IV&V Facility with an assessment of its findings.

1.7 Web and Software Tools Maintenance

1.7.1 *SWG Web Site*

In order to provide a continued dissemination point for SWG materials and information, SETA maintained the SWG web site. This work included maintaining the SWG membership list, ensuring link functionality, and posting new documents and standards as they became available. Within the scope of this effort, the SETA team also developed a Configuration Management plan that defines procedures for controlling updates to IV&V Facility web sites including the SWG.

1.7.2 *SWGIE Web Site*

In direct support of the SWG and its subgroups, the SETA team maintained the Software Working Group Information Exchange (SWGIE) web site. This maintenance included posting

meeting agendas, minutes, and review documents on a regular basis, as well as maintaining user group, access, and password files.

D.N. American provided a test workstation for use in determining the usefulness of HyperMail as an alternative to HyperNews since HyperNews is not Y2K compliant. The network staff installed Linux OS, SWGIE, and HyperMail on the machine so that SETA could began testing. SETA halted the testing process on March 25, 1999 when it was discovered that a requirements list could not be obtained from the SWG. Instead, SETA prepared and delivered a proposal outlining recommendations for dealing with the Y2K non-compliance issue. It is recommended by SETA that attempts to replace HyperNews be delayed until a complete requirements list can be defined from the SWG. It is understood that this will potentially result in SWGIE being taken off-line on or before June 1, 1999 in accordance with the Ames Research Center deadline for eliminating Y2K non-compliant software. NASA IV&V management has not responded to the proposal that was submitted.

The follow on Task Order for this effort, CTO#8 Web Technologies, includes the SWGIE activities, however, the true scope still has not been established.

2   Travel

- Frank Huy traveled to JPL to participate in the SWG face-to-face meeting, in support of the SWG and the OSMA Software Assurance Program, during the week of February 22-26, 1999. Additional information can be found in the trip report.
- Frank Huy, from D.N. American, attended the SEL Workshop held at GSFC on December 2-3, 1998.
- Melanie Gould and Mike Fotta traveled to Nemacolin Resort in Franklin, PA to participate in the Workshop on Risk Management (WoRM) on October 25-26, 1998.

3   In-House Training

- Four members of SETA attended the *Software Assurance and Technology Center's (SATC) Continuous Risk Management Training Course* at the IV&V Facility.
- Two SETA team members attended the Formal Methods Training held at the IV&V Facility on December 8-10, 1998.
- Several team members attended the Trackwise training held February 2, 1999 at the IV&V Facility.
- Two SETA team members attended training on the QUEST and McCabe toolset.
- One SETA member attended training on the System Architect Enterprise Modeling tool on May 10-11, 1999.

4   Deliverables

4.1   Contract Deliverables

- October 1998 Monthly Report
- November 1998 Monthly Report
- December 1998 Monthly Report

- January 1999 Monthly Report
- February 1999 Monthly Report
- March 1999 Monthly Report
- April 1999 Monthly Report
- May 1999 Monthly Report
- New Technology Report
- Quarterly Safety and Health Report
- Acquisition Forecast Report
- Software Reliability Estimation Assessment Report
- National Institute of Standards and Technology (NIST) proposal Assessment Report
- Applying Integrated Safety Analysis Techniques (Software SFMEA and FTA) Assessment Report
- Domain Analysis Guidebook Assessment Report
- QUEST Tool Assessment Report

4.2 Products

- OSMA Software Assurance Program Operating Plan for FY99.
- Concept of Operations (ConOps) for the System and Software Metrics Program (S&SMP)
- Slide Presentation for the ConOps white paper
- OSMA Level 2 Consolidated Plan
- OSMA Level 1 Technical Program Plan for FY 2001
- SWG Training Subgroup Training Course Listing and Matrix
- OSMA/SETA funding justification presentation on January 11, 1999
- OSMA Level One Plan Assessment
- Software Working Group and Subgroups Meeting Reports
- Assessment of the Code IT Section of the Code I CD-ROM
- GMR Assessment
- Proposed GSFC Center Initiatives Analysis Report
- Software Working Group (SWG) Face to Face Assessment Report
- Software Working Group Assessment Report
- SWGIE Proposal

5 Conclusions

SETA's support of the IV&V Facility during CTO#5 evolved from administrative to technical, under the guidance of the IV&V Facility Chief, the NASA COTR, and the SETA PM. Many of the deliverables and products listed in this CTO#5 final report represent the first fruits of the transition. Among the accomplishments of SETA under CTO#5, technical analysis of and feedback on JPL's "Applying Integrated Safety Analysis Techniques" report and a review of and comments on two Center Initiatives titled "Developing a List of Core Software Measures" and "Developing Code Q Training Courses" illustrated the increased beneficial impact that SETA will have under redirection.
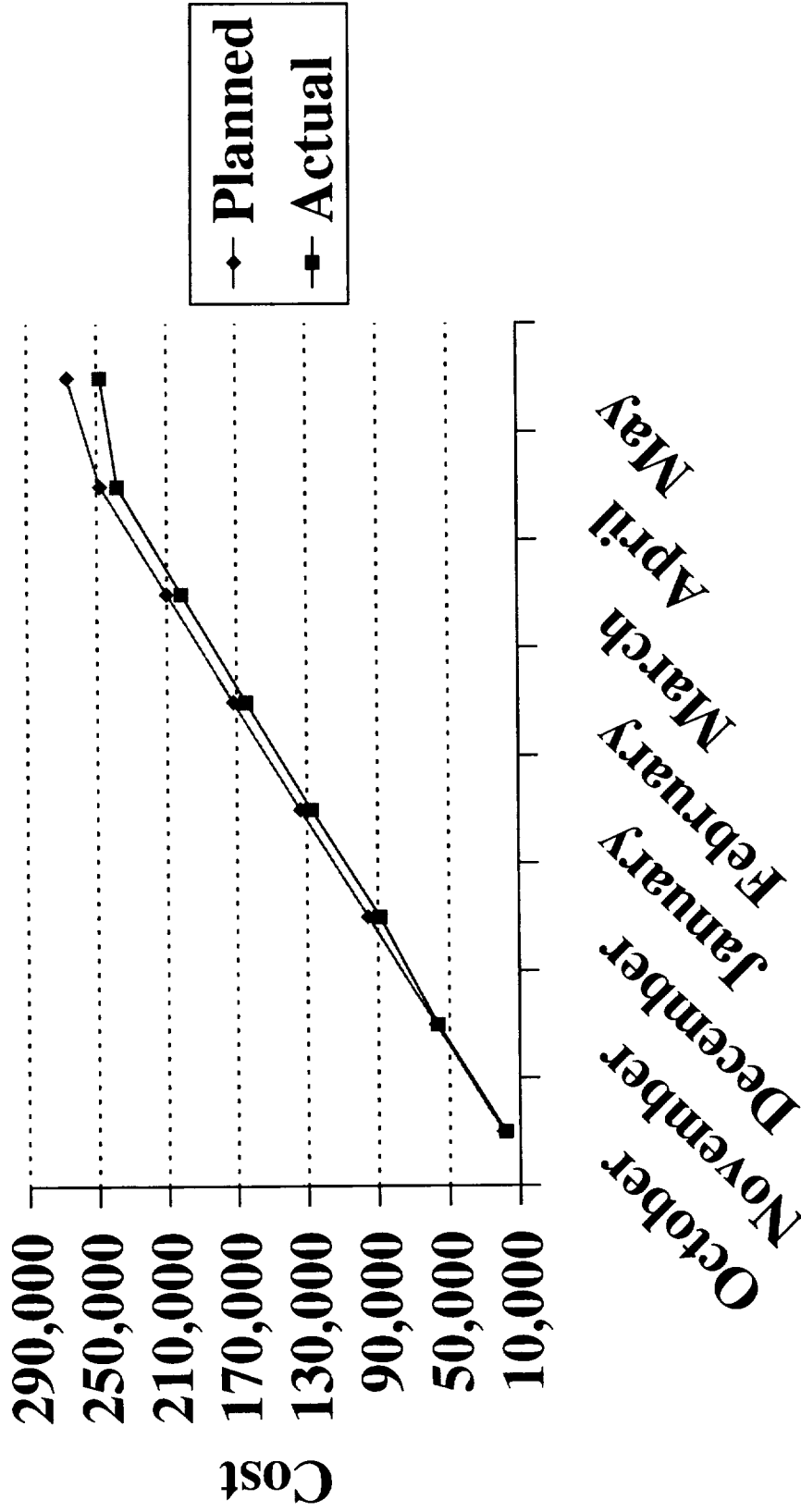
6   Appendix A: Financial Information

6.1   CTO#5 Total Hours: Office of Safety and Mission Assurance (OSMA) Software Program

Employee	Title	Nov98	Dec98	Jan99	Feb99	Mar99	Apr99	May99	Total
Josiah Devasirvatham	Program Manager	104	140	131	102	108	42	36	663
Mike Fotta	Program Manager	126.5	0	0	0	61	87	0	274.5
Frank Huy	Sr. Software Engineer	250	172	220	199	196	175	48	1260
Melanie Gould	Jr. Software Engineer	85.5	11.5	44.5	30	51	33.5	4.5	260.5
ProLogic	Principal Engineer	0	0	0	0	0	5	0	5
ProLogic	Technical Writer	200	124	129.5	114.5	79.5	108	58	813.5
ProLogic	Admin./Tech. Support	0	0	76.5	69.5	0	0	0	146
ProLogic	Software Engineer	75	0	0	0	28	27	0	130
ProLogic	Jr. Software Engineer	0	0	0	66	0	0	0	66
	TOTALS	841	447.5	601.5	581	523.5	477.5	146.5	3618.5

6.2　Total Contract Costs for CTO#5

Total CTO5 Cost	Nov 99		Dec 99		Jan 99		Feb 99		Mar 99		Apr 99		May 99		TOTAL	
	Planned	Actual	Planned	Actual*	Planned	Actual*	Planned	Actual*	Planned	Actual*	Planned	Actual*	Planned	Actual	Planned	Actual
D.N. American Labor Less Fee	19,664.06	24,468.78	19,664.06	21,895.61	19,664.06	25,442.57	19,581.38	21,343.22	19,581.38	21,343.22	19,581.38	20,736.69	9,898.19	5,923.07	137,640.20	159,057.40
Subcontract Labor	12,915.67	9771.36	12,915.67	6,534.70	12,952.74	9,067.50	12,952.74	11,480.84	12,952.74	11,480.84	12,952.74	7,838.38	6,426.46	2,905	90,579.64	58,195.53
Subcontractor Fee on Labor	567.73	586.28	567.73	392.08	569.95	544.05	569.95	688.85	569.95	688.85	569.95	470.30	281.98	174.3	3,984.29	3,491.72
Travel & other ODC's	850.12	0	850.12	840.86	850.12	0.00	850.12	0.00	850.12	0.00	850.12	4,654.56	425.02	0	5,950.80	5,495.42
Material & Handling on Subcontract Labor	1966.56	1420.03	1,966.56	949.66	1,971.95	1,317.74	1,971.95	1,574.02	1,971.95	1,574.02	1,971.95	1,074.64	978.71	398.28	13,790.62	8,220.90
D.N. American Fee (6%)	2157.85	2174.79	2,157.85	1,786.32	2,160.53	2,182.31	2,155.57	2,105.22	2,155.57	2,105.22	2,155.57	1,807.21	1,080.62	564.04	15,116.74	13,737.94
Total Labor Costs	38,121.99	38,421.24	38,121.99	32,399.23	38,169.35	38,554.17	38,081.71	37,192.15	38,081.71	37,192.15	38,081.71	36,581.98	19090.98	9964.69	267,062.29	248,198.97

CTO #5 Cumulative Labor Costs

7   Appendix B: CTO#5 Schedule

ID	Task Name	Start	Finish
1	**Program Management**	**Fri 10/16/98**	**Mon 5/24/99**
2	General	Fri 10/16/98	Mon 5/10/99
3	**Contract Progress Report**	**Fri 11/6/98**	**Fri 5/7/99**
4	Contract Progress Report 1	Fri 11/6/98	Fri 11/6/98
5	Contract Progress Report 2	Mon 12/7/98	Mon 12/7/98
6	Contract Progress Report 3	Fri 1/8/99	Fri 1/8/99
7	Contract Progress Report 4	Fri 2/5/99	Fri 2/5/99
8	Contract Progress Report 5	Fri 3/5/99	Fri 3/5/99
9	Contract Progress Report 6	Wed 4/7/99	Wed 4/7/99
10	Contract Progress Report 7	Fri 5/7/99	Fri 5/7/99
11	CTO Final Report	Mon 5/24/99	Mon 5/24/99
12	Product Review	Fri 10/16/98	Thu 5/6/99
13	Continuous Improvement	Fri 10/16/98	Thu 5/6/99
14	Y2K Compliance	Fri 10/16/98	Thu 5/6/99
15	Develop Y2K Plan	Fri 10/16/98	Thu 11/19/98
16	Y2K Program Plan	Fri 11/20/98	Fri 11/20/98
17	**Documentation Assessment**	**Fri 10/16/98**	**Mon 5/10/99**
18	Strategic & Marketing Plan	Fri 10/16/98	Mon 5/10/99
19	Other Documents	Fri 10/16/98	Fri 4/30/99
20	**Business Process Assessment**	**Fri 10/16/98**	**Fri 4/30/99**
21	Assist with Quarterly Report	Tue 12/1/98	Fri 4/9/99

ID	Task Name	Start	Finish
22	Integrate Project Schedules	Fri 10/16/98	Fri 4/30/99
23	Prepare Acquisition Report	Fri 10/16/98	Tue 12/15/98
24	Acquistion Report	Fri 1/8/99	Fri 1/8/99
25	OSMA Management	Fri 10/16/98	Thu 5/6/99
26	Prepare GMRs	Fri 10/16/98	Thu 5/6/99
27	Prepare OSMA Annual Briefing	Fri 10/16/98	Thu 5/6/99
28	OSMA Review Report (est).	Fri 1/29/99	Fri 1/29/99
29	Update Plans	Fri 10/16/98	Thu 5/6/99
30	Center Initiative Managment	Fri 10/16/98	Thu 5/6/99
31	Assist in CI Management	Fri 10/16/98	Thu 5/6/99
32	Stay Abreast of Research	Fri 10/16/98	Fri 4/30/99
33	Sofware Working Group	Fri 10/16/98	Thu 5/6/99
34	Facilitate SWG Interaction	Fri 10/16/98	Thu 5/6/99
35	Assist in NPG 2820 Development	Fri 10/16/98	Fri 4/30/99
36	SWG Mtg. Report (est.)	Fri 2/19/99	Fri 2/19/99
37	Web & SW Maintenance	Fri 10/16/98	Thu 5/6/99
38	Maintain SWG, SWGIE, OSMA Sites	Fri 10/16/98	Thu 5/6/99
39	Maintain CIM Tool	Fri 10/16/98	Fri 4/30/99
40	Maintain CIM Information	Fri 10/16/98	Thu 5/6/99

Timeline columns: Qtr 4, 1998 (Oct Nov Dec) | Qtr 1, 1999 (Jan Feb Mar) | Qtr 2, 1999 (Apr May Jun) | Qtr 3, 1999 (Jul Aug Sep) | Qtr 4, 1999 (Oct Nov Dec) | Qtr 1, 2000 (Jan Feb Mar) | Qtr 2, 20 (Apr May)

8   Appendix C: Acronyms

AI	Action Item
ARC	Ames Research Center
ASAP	Aerospace Safety Advisory Panel
CFG	Control Flow Graphs
CI	Center Initiative
CIO	Chief Information Officer
CIM	Center Initiative Management
CLCS	Checkout Launch and Control System
ConOps	Concept of Operations
COTR	Contracting Officer's Technical Representative
CTO	Contract Task Order
DNV	Det Norske Veritas
DPM	Delegated Program Manager
FLAVERS	Flow Analysis for Verification of Software
G&A	General and Administrative
GMR	General Management Review
GSFC	Goddard Space Flight Center
IA	Independent Assessment
IS	Intelligent Systems
ISE	Intelligent Synthesis Environment
ISO	International Organization for Standardization
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory
NASA	National Aeronautics and Space Administration
NDA	Non-Disclosure Agreement
NIST	National Institute of Standards and Technology
ODC	Other Direct Cost
OSMA	Office of Safety and Mission Assurance
PM	Program Manager
PMR	Program Management Review
QUEST	Quality Enabling Software Toolkit
S&MA	Safety and Mission Assurance
SAIC	Science Application International Corporation
SEES	Software Engineering Evaluation System
SETA	Science Engineering and Technical Assessments
SWG	Software Working Group
SWGIE	Software Working Group Information Exchange
TPOC	Technical Point of Contact
WoRM	Workshop on Risk Management
Y2K	Year 2000

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