Quarterly Technical Report #4 - Final

DATE: 3/27/2009

Section I
Technical Status Report
Technology Investment Agreement 2008-399
between
the Advanced Technology Institute (ATI)
and
Bender Shipbuilding and Repair Co., Inc.
for
Modern Shipbuilding Design

Bender Shipbuilding and Repair Co., Inc.
Bollinger Shipbuilding
Northrop Grumman Ship Building
Art Anderson & Associates
Genoa Design International
Gibbs & Cox
Marinette Marine Corporation
Murray & Associates, Ltd.
ShipConstructor Software, Inc.
University of Wisconsin at Marinette
University of South Alabama
VT Halter

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Government Purpose Rights

Executive Overview

Bender Shipbuilding and Repair Company, Inc. presented a collaborative effort, which arose from the interest in the STSDEP III Introduction to Shipbuilding course. This is a direct follow-on to the introductory course successfully developed through the collaboration of the STSDEP III shipyards with the design subcontractors and two state educational institutions. All of the participants seek this advanced training regimen as a means to improve readiness of employability, and elimination of or dramatic reduction in the need for shipyards to provide in-house training to new employees.

From the nature of the training modules proposed, it is clear that all new and existing Navy Shipbuilding and repair programs would benefit. Additionally, all Mod Repeats would be of significant benefit. The marine design courses planned through the two participating universities will provide a much needed training base for potential employees, without placing all of the costs of introductory and fundamental training directly onto the shipyards and design agents. Shipyards which are faced with short lead time, one-off design situations and a high level of reliance on design subcontractors for overflow work will be able to take a significant step toward becoming world class competitors because of a world class design system.

Figure 1 Joint Project Meeting in New Orleans at the University of New Orleans/ NGSB

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Project Goals and Objectives

The shipbuilding industry is relying much more heavily on 3D CAD/ Modeling Simulation / Design Tools to help transform itself from a less effective 2D design/ production system into a more state-of-the-art development system that ties product information, design and production into one model. This advancement in Modeling & Simulation / Design Tools introduces a greater level of complexity that requires additional, well-tailored training. Currently, many shipyards are experiencing a "quality" labor shortage, especially in the degreed technical areas required to support excellence. This topic addresses one key element of this issue – the education of introductory personnel into the shipbuilding design areas using current 3D CAD/ Modeling & Simulation / Design Tools. The general objectives to produce Advanced System designers are as follows:

- Improve the Design for Cost of Manufacturing, Producibility, and Maintainability - By using the full capability of the 3D CAD/ Modeling & Simulation / Design Tools and data at hand to increase the focus on producibility with acceptable safety, reliability and efficiency in the design.
- Workforce Interoperability / Maintain Skilled Labor Force / Reduce On-the-Job Training - Increase the adoption of existing skill standards by U.S. shipyards and enable worker interoperability among shipyards through standardized tests and curricula. It is envisioned that the program could be made available to off-yard suppliers that build larger and more complex subassemblies.
- Open Architecture / Information Technology Systems – Development of an open curriculum model that enables multiple developers to collectively and competitively participate in the creation and application of the curriculum.

Technical Progress

This is the Final Technical Status report for the subject agreement. Technical efforts and major developments for the period April 14, 2008 through March 20, 2009 included:

- Held the Kickoff Teleconference – May 7, 2008
- Produced the required Project Plans – (Project Management / Technology Transfer)
- Held Joint Project Meeting at Marinette, WS August 12-14, 2008
- Conducted Modified DACUMs at Bender, Bollinger Shipyards, NGSB and Marinette
- Held another Joint Project Meeting at New Orleans, LA November 9-13, 2008
- Completed development of design courses for the project:
  - Marine Electrical Design
  - Marine HVAC
  - Marine Piping
  - Marine Structural Design
  - Design for Manufacturing and Producibility
- Executed Final Project Meeting at New Orleans, LA March 19, 2009

Project Results

Bender Shipbuilding continued leading in development of this cutting edge concept with the introduction of a "Joint Project Meeting" that reduced overall costs by reducing required travel of members. Reduction in the amount of travel allowed an increased number of personnel being able to attend the meetings. This increase in collaboration on the direction and content of the projects was well rewarded.

The project team has produced five separate design courses instead of the originally proposed four. The courses were built through a high level of collaboration among all members of the project (funded and unfunded). Fincantieri Marine Group (former Marinette Marine) participated and supplied a vast amount of material without any funding. This is just one example of how this project has provided exceptional teaming within the shipbuilding industry to achieve a valued objective.

The Final Project Meeting at the University of New Orleans at Northrop Grumman Shipbuilding in New Orleans, LA provided the project team and related technical representatives a final opportunity to review the work that was completed under the project. With submission of this report and attached DVD, all deliverables are provided and project objectives met.

Course Development

Kim Vosicky with Worldwide Instructional Design Software (WIDS) guided the team through the curriculum design process. Key events were planned based on the WIDS process flowchart. The typical DACUM (Developing a Curriculum) is an occupational analysis method aimed at the achievement of results that may be immediately applied to the development of training curricula. However, none of the members could finally agree to the typical parameters for a standard job and related requirements, which are usually described in a DACUM, map where the job position is described in terms of the required competencies. WIDS therefore used a modified DACUM to acquire a list of agreed to "standard" competences between the project members. While the team began to build the competences for the different courses, it was apparent that breaking the HVAC and Piping into separate components would make the final product cleaner and flow easier.

The team conducted multiple DACUMs with several different Shipyards and Design Agents. The resulting competences were put into a survey for all designated subject matter experts to evaluate and thereby support the creation of the baseline outline. With the core competences established, the team members began providing material to help build the learning activities.

WIDS is a performance-based learning model that is useful to educators because it integrates current learning theory and practice into a practical model that brings together critical elements of performance-based design. In line with strategic planning, the WIDS Model guides teachers and designers to design from the inside out. In other words, what they intend to achieve drives how they approach the task. The model infuses broad, transferable skills called core abilities into occupational and discipline-specific instruction. Flexibility within the model makes it adaptable to varied instructional intents and missions – both academic and technical.

Emphasizing results, the WIDS model recognizes three performance levels. The broadest level incorporates exit learning outcomes, *DACUM/Occupational Analysis*, or External Standards. (A modified Occupational Analysis was used to develop the NSRP courses). At the next level, *competencies* describe major discipline or occupationally specific skills. Each competency is clarified by *performance standards* specifying criteria and conditions for assessment. *Learning objectives* are the enabling instructional outcomes. They describe the lower level, supporting knowledge, skills, and attitudes needed to master a given competency. Beyond the competency framework are those 'below-the-line' development pieces. *Learning Activities* are developed to support the learning objectives and guide the learner through an experience. *Performance Assessment Tasks* are developed to wrap up the design process and connect the competency and supporting performance standards to completion. When a learner successfully masters the performance assessment task designed for a given learning experience, then the student is considered competent in the skill or knowledge presented.

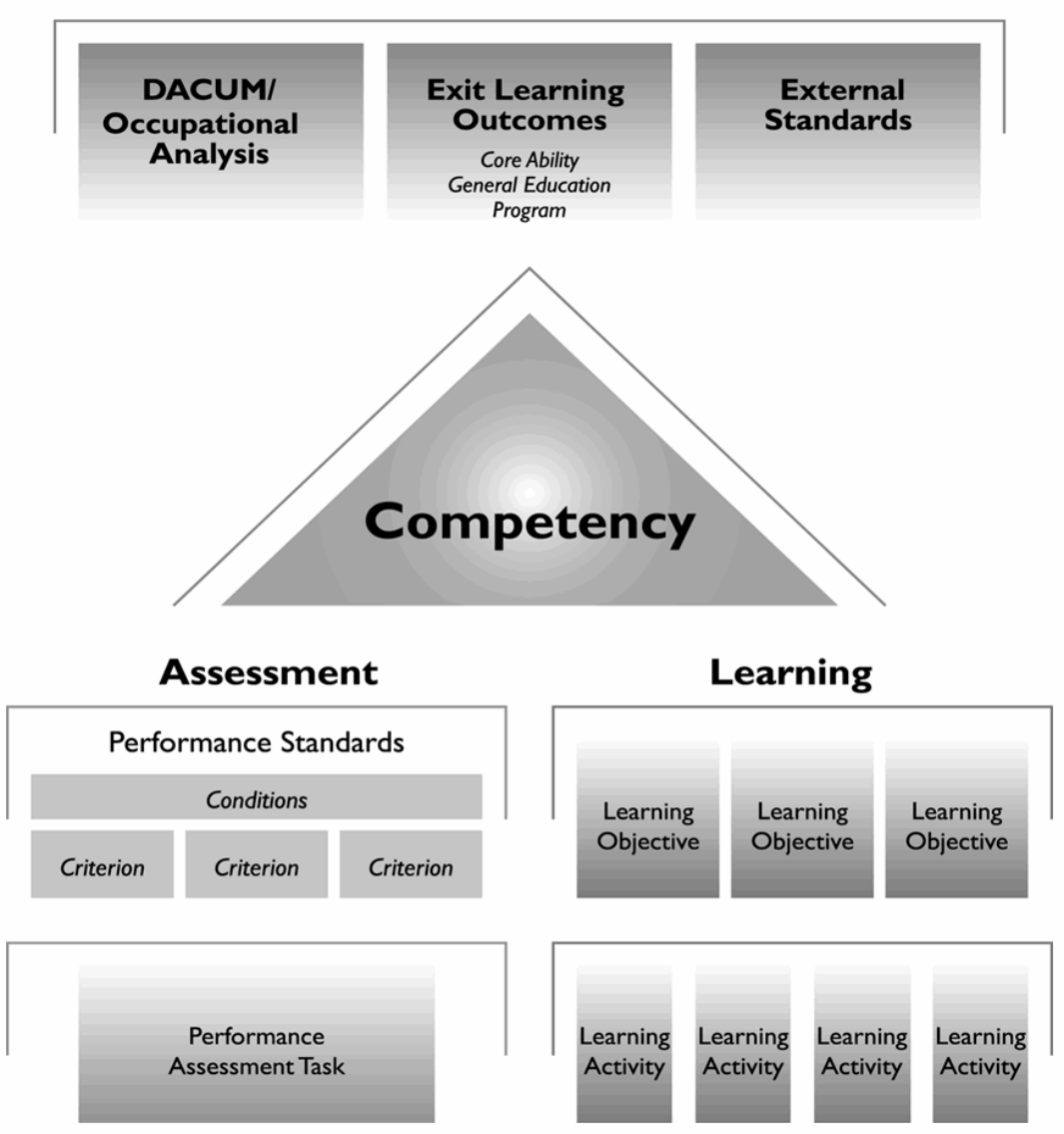

Figure 2 WIDS Process Chart

All of the course material has been arranged onto a DVD to allow ease of distribution within the project team and throughout industry.

1. Course Outcome Summary

This course was built on the principles of performance-based learning and was developed using a process that gathered outcome details from multiple NSRP experts in shipbuilding and design. The course outcome summary includes the validated *competencies, learning objectives* and *performance standards* that comprise what is referred to as the curriculum framework for this course.

Competencies are the major knowledge elements or skills that learners demonstrate through a variety of performance-based assessment strategies. The assessment strategies will vary based on the competency statement. In some instances, assessment may require a short instructor-developed quiz or written summary. In most instances, however, ShipConstructor Software®, the associated 3D marine modeling software company, has developed an interactive model for students to work within and develop basic drawings or modeling documentation. This gives the student actual hands-on, active learning time, allowing them to ultimately *perform* the competency at the end of each learning experience.

Performance Standards point the student (and you) to the condition (or assessment strategy) and criteria necessary for successful demonstration of each competency. In other words, every competency will have a set of performance standards. The same criteria are later used in the Performance Assessment Tasks as the benchmarks for a scoring guide.

Learning Objectives point students to what they will be learning about a competency in order to successfully master it. Learning objectives serve as supporting skills and knowledge statements and drive the direction for the entire learning experience. For each learning objective in this course, there is a learning activity or two to allow the student to comprehend and practice the learning prior to truly applying it for assessment.

2. Learning Plans

Once reviewing the curriculum framework for this course, one must become familiar with the Learning Plans and their learning activities and resources. For each competency in this course, there is a supporting Learning Plan. The learning plan will then have a set of *learning activities*.

Learning Activities have been developed with the guidance of multiple subject matter experts involved in course development. Each activity is designed to support the *learning objectives* and *competency*. Careful consideration was given to learning styles, multiple intelligence and the learning cycle. You will see activities that require **reading, viewing, observing, comparing, contrasting and discussing**, and **practicing**. Built into the learning plans are hot links to videos, website, and the many, many excellent resources/drawings provided by stakeholders of this project.

Learner Resources are built into the learning activities and allow students to view multiple sheets of a given drawing type. In some instances, a link to an AutoCAD drawing will be available, allowing the student to work within AutoCAD, which is required software for this course. All resources, whether drawings, videos, Internet searches, etc. are accessible to the instructor, and can be replaced as necessary or appropriate for the target audience.

3. Instructor Tips for Learning Plans:

Instructors need to become familiar with the learning activities and resources provided. Instructors may choose **not** to require an activity in their version of this course. The Instructor has the freedom to do so. Because this course was written so that it could be delivered in a face-to-face computer lab and classroom, students will have the advantage of face-to-face guidance and wisdom. Online students, however, will not have as much access to the instructor's expertise; however, the instructor can streamline their learning and enhance it by building *Discussion Threads*, *Discussion Blogs*, or *WIKI Pages*. These types of learning tools are all excellent for engaging students in discussion and to track their understanding of a concept with a simple response to a question.

Though the modeling software used in this course includes multiple videos and interactive quizzes to guide students through the modeling exercises, all students may need or require additional help. The instructor may want to consider providing a weekly online *Chat* or *Virtual Meeting* to assist students who may need help in the modeling software or drawing activities. The instructor may have access to both of those types of tools through the institution they are working with.

Instructor Teaching Plans have been provided as MS Word® document. They showcase all of the Learning Plans with learning activities and resource links, but with an area for instructor notes, new resources to use, and even discussion threads you would like to add. Use this document to assist in delivering the learning and assessment for this course.

Performance Assessment Tasks (PAT)
Each course is designed to be completed in about 60 contact hours. At the culmination of all learning plans is a *Performance Assessment Task*, which allows the student to demonstrate the *competency* and apply the skill learned within an assessment. At this juncture of the learning cycle, students are not treading on new turf! They are familiar with the performance standards as outlined in the *Course Outcome Summary*. When it is time for the student to complete the final learning activity or assessment, they should be well on their way to mastery of that skill.

The Performance Assessment Tasks (PAT) are also linked on this site. There is one PAT for every *competency* and every *learning plan*.

Each PAT begins with simple *Directions to the Learner* and a *Scoring Guide* used for student self-assessment and instructor evaluation purposes. The criteria outlined in the scoring guide are identical to the *performance standards* of the target competency.

4. Instructor Tips for Instructor Only Resources

The PATs have simple directions in order to give the instructor, more freedom on how to administer the assessment. For PATs that require the creation of drawings or manipulation within AutoCAD drawings, the instructor is at liberty to pick and choose from any of the resources available in the Instructor Resources Folder. These can be drawings or files the instructor places there or are available as resources for this project.

Please note that an assessment strategy can be changed, as long as the criteria are still addressed. Competencies, learning objectives and performance criteria have been validated and approved. They cannot be altered, but all other pieces of learning can be presented as necessary for the instructor's comfort and student's benefit.

Resources Needed

The core material is located on the DVD attached to this final report. Part of the course work includes working inside up to four different ShipConstructor product models. Three of the models can be run with any ShipConstructor license of level 3 and above. This does not cause any issues as all the participants of the project have licenses well above the required level. Students who have ShipConstructor licenses of five or above can use a product model contained on the DVD of the Navy's Torpedo Weapon Retrieval vessel know as the TWR. The team used the TWR because it is not classified and is the key vessel design used for interoperability between different CAD packages. All NAVSEA related drawings of the vessel have been included as well.

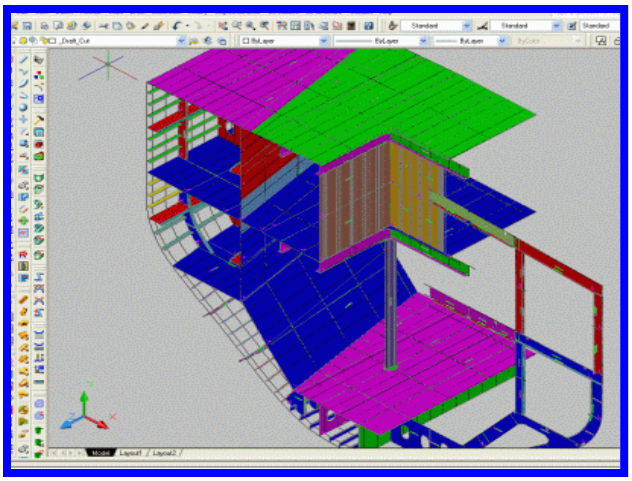

Figure 3 Model SC018

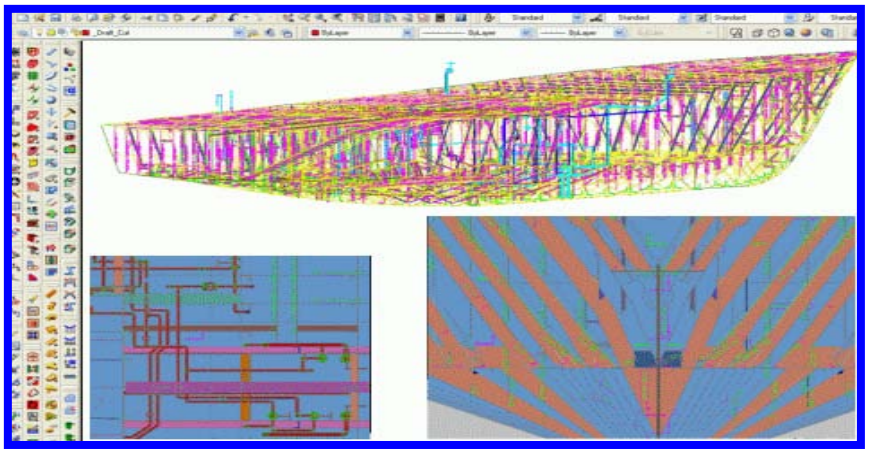

Figure 4 TWR Model

Course Resource & Release Tracking

The project team has addressed the release of all material and has been tracking the data that have been used in producing the course documents. The team created a spreadsheet to track where a resource came from and detailed information on the release status of the data for use in the project.

Major Impacts on Shipyards

The courses provided through this project are a big step forward in developing standardization of the skill sets required of the CAD drafter and modelers. The course will have a known set of skills that the Shipyard and Design agent will understand thereby assisting greatly in the hiring and training process. The project has focused attention particularly on the Job Training (OJT) provided to employees and the courses provided can help standardize that OJT while simultaneously reducing the level of effort of instructors through the documentation provided on the DVD.

Technology Transfer

During the project, the Modern Shipbuilding Design team has, on more than one occasion, received press coverage in the local Marinette newspaper. The paper gave a review of the current project and touted the success to date of the first course produced under NSRP with the STSDEP III project. The team has also provided presentations at NSRP panel meetings. The first presentation was given at the NSRP Crosscut Meeting conducted in Bath, Maine on October 22-23, 2008.

The team gave a follow-on presentation at the NSRP Joint Panel meeting in New Orleans, Louisiana held December 10-11, 2008. At the second presentation, Bender Shipbuilding gave a review of the conducted class and an overview of some of the more salient modifications made to the original course.

During the last quarter of the project, the team had representatives present material to the Executive Control Broad and the NSRP's Crosscut panel on February 4th, 2009 in Mobile, AL. All the presentations received warm responses and positive reviews from the attendees, leading to increased interest in the currently available course produced under the Second Tier Shipyard Design Enhancement Project.

Realized Benefits to Industry and Navy

All new and existing Navy shipbuilding and repair programs would benefit from well-considered and benchmarked training regimens in the above areas. Employee training is critical to all Navy shipbuilding and repair programs. Currently, most shipyards are facing personnel shortages in skilled engineering capabilities. This shortage is becoming more acute in the technical areas and the above training regimen will greatly help in providing shipyards with a cost-effective way of addressing this issue.

Section II
Business Status Report
Technology Investment Agreement 2008-399
between
the Advanced Technology Institute (ATI)
and
Bender Shipbuilding and Repair Co., Inc.
for
Modern Shipbuilding Design

Agreement Summary Information

Total Amount of the Agreement:	$1,612,512
Total Estimated NSRP ASE Project Funding of the Agreement:	$ 696,778
Total Estimated Recipient Cost Share:	$ 915,734
Total Funds Obligated:	$ 696,778

Project Resource/Cost Information:

The following resources/costs are applicable to this project for the period April 14, 2008 through March 20, 2009:

Man Hour and Material Costs

Status of Man Hours, Material & Personal - Phase I

Company	Man Hours Provided This Period **	Cumulative Man Hours Provided **	Significant Material Costs This Period	Cumulative Material Costs	List of Personnel Working This Period
Bender	238	714	3,673	9,093	Wilber, Shank, Chatel, Ringer, Wilson
SSI	448	736	0	0	Oetter, Larkins, Chamberlain, Goot
Murray & Assocaties	58	174	0	0	Hains
Art Anderson Assoc.	58	174	0	0	Selvidge, Duncan
Bollinger Shipyards	67	201	0	0	Fanguy, Knight, Matherne
Genoa Design International	51	153	0	0	Pecore, Whitelaw
Gibbs and Cox	44	88	0	0	Smith
Univ. of Wisconsin	406	1218	0	0	Lanteau, WIDs
Univ. of South Alabama	406	812	0	0	Miles, WIDs

Status of Milestones Milestone

	Milestone Number and Description	Percentage Completed During this Period	Cumulative Percentage Completed
1	**Development Interim Status Report #1**	0	100
	a. Kick-Off Meeting w/Mtg Minutes and Required Project Plans b. Project Management Plan c. Software Development Plans d. Technology Transfer Plan e. Marine Structural Design f. Marine Piping & HVAC g. Marine Electrical Design h. Design for Manufacturing and Producibility		
2	**Quarterly Technical and Business Project Status Report #1**	0	100
3	**Development Interim Status Report #2**	0	100
	a. Marine Structural Design b. Marine Piping & HVAC c. Marine Electrical Design d. Design for Manufacturing and Producibility		
4	**Quarterly Technical and Business Project Status Report #2**	0	100
5	**Development Interim Status Report #3**	100	100
	a. Marine Structural Design b. Marine Piping & HVAC c. Marine Electrical Design d. Design for Manufacturing and Producibility		
6	**Quarterly Technical and Business Project Status Report #3**	100	100
7	**Development Interim Status Report #4**		
	a. Marine Structural Design b. Marine Piping & HVAC c. Marine Electrical Design d. Design for Manufacturing and Producibility		
8	**Phase Final Technical and Business Project Status Report**		
	a. Includes DVD/s containing all course and online material (SCORM compliant) b. Results of any course beta testing c. Project Results template		

Interest Earned **$ N/A**

Cost Share Provided by Project Participants

Cost share in the amount of $ 26,250 is provided for this reporting period.

Cumulative cost share to date for the project is $ 915,734

The following summarizes the cumulative cost share provided for this project by category:

Participant-Provided Resources					
Resource Type	**Type A Cumulative Private Sector** (Federal Sources) Matching Funds	**Type B Cumulative Private Sector** (Non-Federal Sources) Matching Funds	**Cumulative Public Sector** participant provided funding	**Total** less Public Sector provided funding	**Explanation**
Funding Resources					
Cash - (including donations from state or local governments) Examples include the outlay of funds to support the proposed statement of work through the acquisition of material or equipment and paying company cash for subcontractor labor or consultant cost	$2,100	$32,900		$35,000	Funding the Marine Institute
Labor costs - associated with allowable labor cost categories that are not billed directly to program funds (e.g., SP Panel members)	$ -	$ -			
Expenses - associated with allowable labor cost categories that are not billed directly to program funds (e.g., ECB member travel)					
Overhead - (excluding labor related fringe benefits)					
General and Administrative Services					
SBIR and **STTR** in accordance with Government guidelines	$ -				
IR&D - (Internal Research and Development)		$ -			
M&PE - (Manufacturing and Production Engineering)					
Estimated **Implementation Costs** for activities specifically included in participant proposals					
In-Kind Resources					
Use of Existing equipment - (estimated fair market value)					
Use of Existing software - (estimated fair market value)	$140,918	$739,817		$880,734	SSI Software
Intellectual property - (market value)					
Space - (land or buildings)					
Totals	**$ 143,018**	**$ 772,717**	**$ -**	**$ 915,734**	

*IR&D matching funds should be identified separately and not included in the Overhead line.

The project participant funds reported are supported by the records of this organization or input provided by other team members and/or subcontractors and are for the purposes of completing NSRP-ASE TIA #2008-399. The amounts reflected for federal and non-federal sources are ***estimated*** *using the NSRP Program methodology specified in the TIA* and summarized as follows:

Type A Matching Funds: Private-sector participant provided funding from federally funded revenue sources and private-sector participant provided funding from federally funded revenue sources that might not meet the definition of Type B Match (e.g., fraction of the project labor charged to overhead that reflects the fraction of company revenue from federal contracts).

Type B Matching Funds: Private-sector participant provided funding from non-federally- reimbursed sources (That portion of project or program costs not borne by the Federal Government. Examples include funding from profit or a fraction of the project labor charged to overhead that reflects the fraction of company revenue from non-federal contracts).

Public-sector participant provided funding (formerly called 'Donated services' from naval shipyards & federal labs).

Note: If a project participant considers their 'gross revenue fraction' to be proprietary data, report the Total by category to the Prime, and provide a copy of this input to ATI along with the 'gross revenue fraction' to permit ATI to use in preparation of the NSRP Program Business Status Report to the Navy.

Discussion

This is the Third Business Status Report for the subject Technology Investment Agreement.
There has been no variance in expenditures.

Modifications to Estimated Milestone Payments

(Not Applicable)

Signature

Title R&D Manager
Date 3-26-09

I certify to the best of my belief that this report is correct and complete and that all costs are supported by the records of this organization or input provided by other team members and/or subcontractors and are for the purposes of completing NSRP-ASE TIA #2008-399.