

**UNCLASSIFIED**

**EXHIBIT R-2, FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET**

**DATE: February 2000**

**BUDGET ACTIVITY: 7**

**PROGRAM ELEMENT: 0205601N**

**PROGRAM ELEMENT TITLE: HARM Improvement**

**( U ) COST: (Dollars in Thousands)**

<u>Project Number &amp; Title</u>	<u>FY 1999 Actual</u>	<u>FY 2000 Budget</u>	<u>FY 2001 Estimate</u>	<u>FY 2002 Estimate</u>	<u>FY 2003 Estimate</u>	<u>FY 2004 Estimate</u>	<u>FY 2005 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
E1780 HARM Improvement	6,999	11,260	9,469	5,057	3,920	2,094	2,168	0	51,256
E2185 Advanced Anti-Radiation Guided Missile (AARGM)	20,485*	25,700**	8,979	0	0	0	0	0	120,597***
E2211 Joint Advanced Weapons System (JAWS) (Army Lead)	927	1,467	2,907	3,819	3,778	3,744	3,737	0	23,137
<b>TOTAL</b>	<b>28,411</b>	<b>38,427</b>	<b>21,355</b>	<b>8,876</b>	<b>7,698</b>	<b>5,838</b>	<b>5,905</b>	<b>0</b>	<b>194,988</b>

\* The FY99 budget reflects a \$12.0M Congressional Add for AARGM (W2661/E2661), which has been decreased by \$378K for Congressional undistributed adjustments.

\*\* The FY00 budget reflects a \$15M Congressional Add for AARGM (E2185), which has been decreased by \$60K for Congressional undistributed adjustments.

\*\*\* Funding prior to FY97 for this project is under PE 0603217N. E1780, E2185,E2211 were previously executed under W1780, W2185, W2211 respectively.

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

(U) E1780/HIGH-SPEED ANTI-RADIATION (HARM) IMPROVEMENT: The HARM Improvement Program consists of two improvement efforts: a tactical software upgrade (Block V) to the missile and the International HARM Upgrade Program (IHUP) (Block VI). Block VI is a tri-national Precision Navigation Unit (PNU) cooperative program consisting of a USN-unique tactical software upgrade and a hardware upgrade which includes an Inertial Measurement Unit (IMU) and a Global Positioning System (GPS) receiver. This will provide a much improved guidance capability for the current AGM-88B missile (in German and Italian inventories) and AGM-88C missile (in U.S. inventory). This IMU/GPS system will be retrofitted into existing missiles, as a kit, at the depot.

(U) E2185/ADVANCED ANTI-RADIATION GUIDED MISSILE (AARGM) and W2661/AARGM (Congressional Add): AARGM is a Phase III Small Business Innovative Research (SBIR) program designed to demonstrate an advanced dual-mode seeker on an existing High speed Anti-Radiation Missile (HARM) airframe. For ease of tracking, Project Unit W2661 is included in the E2185 funding profile.

(U) E2211/JOINT ADVANCED WEAPONS SYSTEM (JAWS): JAWS is a proposed joint service program to support Army and USMC Mission Need Statements for multi-role follow-on weapons to the TOW and Hellfire missiles. The DON is participating with the Army in joint trade studies, Analysis of Alternatives, and the development of Milestone 0 support documentation.

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**PROGRAM ELEMENT: 0205601N**

**PROGRAM ELEMENT TITLE: HARM Improvement**

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under OPERATIONAL SYSTEMS DEVELOPMENT because it encompasses engineering and manufacturing development for upgrade of existing, operational systems.

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**EXHIBIT R-2a, FY 2001 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET**

**DATE: February 2000**

**BUDGET ACTIVITY: 7**

**PROGRAM ELEMENT: 0205601N  
PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E1780  
PROJECT TITLE: HARM Improvement**

(U) COST: (Dollars in Thousands)

<u>Project Number &amp; Title</u>	<u>FY 1999 Actual</u>	<u>FY 2000 Budget</u>	<u>FY 2001 Estimate</u>	<u>FY 2002 Estimate</u>	<u>FY 2003 Estimate</u>	<u>FY 2004 Estimate</u>	<u>FY 2005 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
E1780 HARM Improvement	6,999	11,260	9,469	5,057	3,920	2,094	2,168	0	51,256
<b>TOTAL</b>	<b>6,999</b>	<b>11,260</b>	<b>9,469</b>	<b>5,057</b>	<b>3,920</b>	<b>2,094</b>	<b>2,168</b>	<b>0</b>	<b>51,256</b>

Quantity of RDT&E Articles: N/A

**(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The High-speed Anti-Radiation Missile (HARM) is a joint service program with the Air Force (NAVY lead). The program has been in full production since FY 1983. Program Element 0205601N was used until FY 1990 to develop and test one hardware and two software upgrades to the HARM as Engineering Change Proposals (ECPs). Another ECP software program (Block V) was recently developed (FY96 through FY99) to modify HARM software in order to meet operational requirements. This joint service upgrade was developed with Air Force funds under Raytheon Missile Systems Company Contract N0001993G0179. The Air Force funded all contractor development and contractor Test and Evaluation (T&E) cost. The Navy funded all government costs related to development and T&E. The tactical software upgrade will give HARM a Home-On-Jam (HOJ) capability, improved geographic specificity, and improved capability against advanced waveforms. Studies to address corrective actions for documented deficiencies will be conducted. A portion of the HARM inventory is being reprogrammed with Block V software this year. Project is expected to terminate in FY00 when Block V software is distributed to the Fleet.

The International HARM Upgrade Program is a tri-national (U.S., Italy, and Germany) cooperative program designed to improve the HARM's effectiveness by enhancing the missile's probability of kill and reducing the potential for fratricide while making the missile easier to employ. The Program consists of significant hardware and software modifications to the missile's control and guidance sections. The USN frequently refers to the IHUP upgrade as Block VI. The three nations involved have agreed to jointly fund the design, development, testing and production of hardware kits to be installed in the missile control section along with an improved software version to be installed in the missile guidance section.

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**PROGRAM ELEMENT: 0205601N  
PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E1780  
PROJECT TITLE: HARM Improvements**

**( U ) PROGRAM ACCOMPLISHMENTS AND PLANS:**

1. FY 1999 ACCOMPLISHMENTS:

- (U) (\$1788) Completed the NAWCWD China Lake Block V joint service support of the combined DT/OT program. Completed government development of ELINT, TAMPS, and avionics updates required for the Block V Upgrade. Conducted the Functional Configuration Audit/Physical Configuration Audit and development of the Engineering Change Proposal to incorporate the Block V software into the HARM inventory.
- (U) (\$ 822) Provided HARM Block V system engineering support of development and systems integration efforts. Continued weapon system upgrade studies assessing weapons service life, missile performance, deficiencies, and logistics requirements.
- (U) (\$326) Provided logistic support by Government personnel of Block V Software Upgrade to HARM missiles at field sites.
- (U) (\$14) Continued Contractor Engineering and Project Management Services in support of the HARM Upgrade Program (Block VI) contract.
- (U) (\$500) Initiated Contractor development of Block VI USN unique software subroutines. Initiated design/development of Inertial Measurement sub-systems and development of hardware and software associated with Block VI.
- (U) (\$1,205) Continued Contractor Engineering and Project Management Services in support of the HARM Upgrade Program (Block VI) contract.
- (U) (\$36) Continued Government Project Management Services in support of HARM (Block V) Program.
- (U) (\$50) Continued Government Project Management Services in support of HARM (Block VI) Program
- (U) (\$551) Continued Government engineering support of the HARM Upgrade Program (Block VI) including preparation for a Preliminary Design Review; support for the Interface Control Working group in defining interface requirements; supporting contractor sub-system design, analysis and testing.
- (U) (\$15) Continued Government support of contractor testing including evaluation of test plans, reports, and preparation of detailed test planning documentation.
- (U) (\$142) Initiated Government logistic support including logistics support analyses and evaluating contractor designs for Block VI.

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**PROJECT NUMBER: E1780**  
**PROJECT TITLE: HARM Improvements**

- (U) (\$1,550) Continued Government and contractor participation in developing the aircraft avionics updates required by the HARM Upgrade Program (Block VI) in addition to CLC/TAMPS upgrade efforts and ELINT development.

2. **FY 2000 PLAN:**

- (U) (\$5,624) Continue design/development of Inertial Measurement sub-systems and development of hardware and software associated with Block VI. Continue development of Block VI USN unique software sub-routines.
- (U) (\$354) Continue Engineering and Project Management Services in support of the HARM Upgrade Program (Block VI) contract.
- (U) (\$891) Continue Government engineering support of the HARM Upgrade Program (Block VI) including preparation for Critical Design Review of Block VI software/hardware design. Effort includes further engineering studies, threat analysis, 6 Degrees of Freedom (DOF) analysis, documentation analysis, interface definition, precision navigation engineering, and software quality evaluation.
- (U) (\$137) Continue Government support of contractor testing including evaluation of test plans, reports, and preparation of detailed test planning documentation, and captive flight testing.
- (U) (\$271) Continue Government logistic support including logistics support analyses, maintenance engineering, support equipment engineering, and evaluating contractor designs.
- (U) (\$3,983) Continue Government and contractor participation in integration efforts. Continue developing the aircraft avionics updates required by the HARM Upgrade Program (Block VI) in addition to Command Launch Computer (CLC)/TAMPS upgrade efforts and ELINT development. Develop HARM TAMPS/Mission Planning Module (MPM) rehost.

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PROGRAM ELEMENT TITLE: HARM Improvement

PROJECT TITLE: HARM Improvements

3. FY 2001 PLAN:

- (U) (\$4,908) Continue design/development of Inertial Measurement sub-systems and development of hardware and software associated with Block VI. Continue development of Block VI USN unique software sub-routines.
- (U) (\$400) Continue Engineering and Project Management Services in support of the HARM Upgrade Program (Block VI) contract.
- (U) (\$1,343) Continue Government engineering support of the HARM Upgrade Program (Block VI) including preparation for Critical Design Review of Block VI software/hardware design. Effort includes further engineering studies, threat analysis, 6 Degrees of Freedom (DOF) analysis, documentation analysis, interface definition, precision navigation engineering, and software quality evaluation.
- (U) (\$145) Continue Government support of contractor testing including evaluation of test plans, reports, and preparation of detailed test planning documentation, and captive flight testing.
- (U) (\$222) Continue Government logistic support including logistics support analyses, maintenance engineering, support equipment engineering, and evaluating contractor designs.
- (U) (\$2,451) Continue Government and contractor participation in integration efforts. Continue developing the aircraft avionics updates required by the HARM Upgrade Program (Block VI) in addition to Command Launch Computer (CLC)/TAMPS upgrade efforts and ELINT development. Develop HARM TAMPS/Mission Planning Module (MPM) rehost.

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(U) B. PROGRAM CHANGE SUMMARY

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
(U) FY 2000 President's Budget:	7,148	11,323	9,577
(U) Appropriated Value:	7,448	11,323	0
(U) Adjustments from Pres Budget:	-149	-63	-108
(U) FY 2001 President's Budget Submit:	6,999	11,260	9,469

CHANGE SUMMARY EXPLANATION:

(U) Funding:

The FY 1999 decrease of \$149 thousand reflects a \$33 thousand reduction for the SBIR assessment, a \$79 thousand reduction for the Smart Work/TOC initiative, and a \$37 thousand reduction for inflation savings.

The FY 2000 decrease reflects a \$63 thousand reduction for an Across-the-Board Congressional rescission.

The FY 2001 decrease of \$108 thousand reflects a \$5 thousand reduction for Strategic Sourcing Plan savings, a \$78 thousand decrease for revised economic assumptions, and a \$25 thousand decrease for prioritization of requirements within the Navy.

(U) Schedule: All dates occur one quarter (1Q) later than previously reported due to recognition that HARM International Upgrade Program operates on a calendar year. Dates currently reflect planned milestone by fiscal year.

(U) Technical: No changes

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(U) C. OTHER PROGRAM FUNDING SUMMARY

<u>Appn</u>	FY 1999 <u>Actual</u>	FY 2000 <u>Budget</u>	FY 2001 <u>Estimate</u>	FY 2002 <u>Estimate</u>	FY 2003 <u>Estimate</u>	FY 2004 <u>Estimate</u>	FY 2005 <u>Estimate</u>	To <u>Complete</u>
WPN HARM MODS	0	89,300	0	0	10,518	10,769	10,955	16,570

Related RDT&E Not Applicable

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(U) D. ACQUISITION STRATEGY:

The HARM Block VI Upgrade program is an ACAT III Program and will consist of three separate phases (EMD, Production, and Technology Evaluation and Assessment). The acquisition strategy for the HARM Block VI Program is complete and is based upon a signed international Memorandum of Agreement with Germany, Italy, and the U.S. Navy; a tri-national Cooperative Operational Requirements Document (CORD) details German, Italian, and U.S. Navy common requirements; and a Cooperative Test and Evaluation Master Plan (CTEMP) summarizes all test requirements. These three documents drive the overall acquisition approach to the HARM Block VI project.

Management of the Block VI upgrade will be directed by a trilateral Steering Committee, however, the U.S. Navy Project Manager (in concert with Project Managers from Germany and Italy) is responsible for Program execution. Each partner will share one-third of "common costs," the U.S. Navy will fund Block VI unique costs, and the German and Italian participants will fund Block IIIB unique costs. Each country will pay its own aircraft integration costs.

The acquisition strategy delineates Industry and Government responsibilities. The contract strategy (i.e. hardware and software for missile, upgraded missile sections, contractor team responsibility for missile performance) assigns unique work tasks to each firm. Contract strategy is to issue contracts to Bodenseewerk Geratetechnik GmbH (BGT) (German), Alenia Difesa (Italian), and Raytheon Texas Instruments Systems (RTIS) (U.S.) firms and will maximize use of commercial-off-the-shelf (COTS)/government-off-the-shelf (GOTS)/non-development items (NDI). Each Phase I (EMD) contract type and structure is tailored to the product of each firm.

(U) E. SCHEDULE PROFILE

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>To Complete</u>
(U) Program Milestones	M/S II (2Q/99)			
(U) Engineering Milestones		PDR (1Q/00)	CDR(1Q/01) TRR(4Q/01)	
(U) T&E Milestones			Combined DT/OT (Start 4Q/01)	Combined DT/OT (End 2Q/02)
(U) Contract Milestones	RTIS, BGT & ALENIA (1Q/99)*			

\* BGT and ALENIA Contracts are not funded with U.S. funds, but are significant milestones in the Block VI contract schedule.

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EXHIBIT R-3, FY 2001 RDT&E,N COST ANALYSIS

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PROGRAM ELEMENT: 0205601N  
PE TITLE: HARM Improvement

PROJECT NUMBER: E1780  
PROJECT TITLE: HARM Improvements

<u>Cost Categories:</u>	<u>Contract Method &amp; Type</u>	<u>Performing Activity &amp; Location</u>	<u>Total Prior Yrs Cost</u>	<u>FY 1999 Cost</u>	<u>FY 1999 Award Date</u>	<u>FY 2000 Cost</u>	<u>FY 2000 Award Date</u>	<u>FY 2001 Cost</u>	<u>FY 2001 Award Date</u>	<u>Cost to Complete</u>	<u>Total Cost</u>	<u>Target Value of Contract</u>
<b>Product Development</b>												
Block IIIA/V Development	WX	NAWC WD, China Lake	5961	1788	Oct 98	0	N/A	0	N/A	0	7749	
Block IIIA/V Development	WX	SPAWAR, San Diego, CA	125	326	Sep 98	0	N/A	0	N/A	0	451	
Block VI Development	CPIF	RSC, Tucson AZ	0	500	Sep 99	5624	Jan 00	4908	Jan 01	3375	14407	14,407
Block VI Eng Analyses	FFP	BGT, Germany	240	0	N/A	0	N/A	0	N/A	0	240	240
Block VI Development	WX	RTIS, Texas	1099	551	Oct 98	891	Oct 99	1343	Oct 00	1525	5409	
Block VI ILS	WX	NAWC WD, China Lake	0	142	Oct 98	271	Oct 99	222	Oct 00	790	1425	
		Point Mugu										
<b>Subtotal Product Development</b>			<b>7425</b>	<b>3307</b>		<b>6786</b>		<b>6473</b>		<b>5690</b>	<b>29681</b>	<b>14,647</b>
<b>Remarks: NONE</b>												
<b>Support</b>												
HARM Technical/Integration Studies	WX	NAWC WD, China Lake	110			0		0		0	110	
<b>Subtotal Support</b>			<b>110</b>	<b>0</b>		<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>110</b>	

Remarks: NONE

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**EXHIBIT R-3, FY 2001 RDT&E,N COST ANALYSIS**

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**PROGRAM ELEMENT: 0205601N  
PE Title: HARM Improvement**

**PROJECT NUMBER: E1780  
PROJECT TITLE: HARM IMPROVEMENT**

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999		FY 2000		FY 2001		Cost to Complete	Total Cost	Target Value of Contract
				FY 1999 Cost	Award Date	FY 2000 Cost	Award Date	FY 2001 Cost	Award Date			
Test and Evaluation												
Block IIIA/V	WX	NAWC WD, China Lake	1524	822	Oct 98	0	N/A	0	N/A	0	2346	
Block VI	WX	NAWC WD, China Lake	24	1565	Oct 98	4120	Oct 99	2596	Oct 00	6567	14872	
<b>Subtotal Test &amp; Evaluation</b>			<b>1548</b>	<b>2387</b>		<b>4120</b>		<b>2596</b>		<b>6567</b>	<b>17218</b>	
<b>Remarks: NONE</b>												
<b>Management</b>												
Block IIIA/V TRAVEL	WX	NAWC AD, Patuxent MD	149	36	Oct 98	0					185	
Block VI TRAVEL	WX	NAWC AD, Patuxent MD	30	50	Oct 98	24	Oct 99	45	Oct 00	75	224	
Block IIIA/V Tech Assessm't/Mgmt Supp.	RX/LOE	NSM, Alex VA	0	14	Mar 99	0		0		0	14	14
Block VI Tech. Assessm'ts/Mgmt Support	RX/LOE	DCS, Alex VA	1027	1205	Dec 98	330	Dec 99	355	Dec 00	907	3824	3824
<b>Subtotal Management</b>			<b>1206</b>	<b>1305</b>		<b>354</b>		<b>400</b>		<b>982</b>	<b>4247</b>	<b>3838</b>
<b>Remarks: NONE</b>												
<b>Total Cost</b>			<b>10289</b>	<b>6999</b>		<b>11260</b>		<b>9469</b>		<b>13239</b>	<b>51256</b>	<b>18485</b>

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**PROGRAM ELEMENT: 0205601N**  
**PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185**  
**PROJECT TITLE: Advanced Anti-Radiation Guided Missile(AARGM)**

**(U) COST: (Dollars in Thousands)**

<u>Project Number &amp; Title</u>	<u>FY 1999 Actual</u>	<u>FY 2000 Budget</u>	<u>FY 2001 Estimate</u>	<u>FY 2002 Estimate</u>	<u>FY 2003 Estimate</u>	<u>FY 2004 Estimate</u>	<u>FY 2005 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
E2185 Advanced Anti-Radiation Guided Missile (AARGM)	20,485**	25,700***	8,979	0	0	0	0	0	120,597*

\* Funding prior to FY97 for this project is under PE 0603217N

\*\* FY99 budget reflects a \$12.0M Congressional add for AARGM (W2661/E2661), which decreased by \$378K for Congressional undistributed adjustments.

\*\*\* The FY00 budget reflects a \$15M Congressional Add for AARGM (E2185), which was decreased by \$60K for Congressional undistributed adjustments.

**A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:**

The Advanced Anti-Radiation Guided Missile (AARGM) Project is a Phase III Small Business Innovative Research (SBIR) program to develop and demonstrate a dual-mode guidance section on a HARM airframe. The AARGM Phase III technology demonstration program is designed to demonstrate that a Dual-mode (passive Anti-Radiation Homing (ARH)/active Millimeter Wave (MMW) radar) missile can engage and destroy enemy air defenses in the event that these systems “shut-down” or employ other countermeasures.

The issue of “shut-down” has been a major shortcoming in the suppression of enemy air defenses (SEAD) element of the offensive counter air mission area for the United States Navy and Air Force. Program objectives are to demonstrate an effective and affordable lethal SEAD capability against mobile, relocatable, or fixed air defense threats even in the presence of emitter shutdown or other Anti-Radiation Missile (ARM) countermeasures. The dual-mode technology being developed in the AARGM program has very high potential to solve the problem of “shut-down” not only in the primary weapon for SEAD, the High Speed Anti-Radiation Missile (HARM), but it could be integrated with many other missile airframes.

The AARGM technology demonstration program is an outgrowth of a Phase I and II competitive SBIR program. Phase I and II SBIR efforts successfully demonstrated the feasibility of a dual-mode seeker to address radar “shut-down” issues. Science and Applied Technology (SAT), Inc. (San Diego, CA), was awarded Phase I and II contracts (FY90-93) and was subsequently selected for a Phase III demonstration in FY94. Phase III work is being performed by SAT under NAVAIR contract N00019-94-C-0078. This contractual effort will continue to be incrementally funded, under program element 0205601N, resulting in a cumulative contract value of \$150.4M.

From FY93 through FY98, the AARGM program was a Congressionally mandated program which received its funding as an annual Congressional add. Starting in FY99, AARGM received its program funding through the standard DoD budget appropriation process. The FY99 funds added by Congress are being used to perform risk reduction tasks in preparation for a potential Milestone II Decision in FY 2003.

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PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185  
PROJECT TITLE: Advanced Anti-Radiation Guided  
Missile(AARGM)**

**1. (U) FY 1999 ACCOMPLISHMENTS:**

- (U) (\$7,040) Contractor developed software evaluation station, including hardware and software development, subsystems assembly and test, and seeker integration tests.
- (U) (\$1,596) Field activity provided AARGM system engineering support of development and systems integration efforts related to the design, test and integration of alternative cost-reduction and risk-reduction technologies in the AARGM anti-Radiation Homing (ARH) subsystem.
- (U) (\$100) Government performed technical analyses and continued technical management, engineering support, and coordination of AARGM Program weapons system technology development program.
- (U) (\$824) Contractor performed program management and engineering services in support of the AARGM technology demonstration program. Provided technical management support and coordination of AARGM Program weapons system technology studies.
- (U) (\$8,805) Contractor performed risk reduction activities. Activities included ARH antenna array performance and affordability and producibility enhancements, MMW radar transceiver performance and affordability enhancements, EMI enhancements, radome material trade studies and advanced target discrimination algorithm development and validation.
- (U) (\$2,120) Field activity assisted in generating required documentation, including life cycle cost analysis and draft ORD development and aircraft integration definitions. Field activity also provided system engineering support for prime contractor.

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PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185  
PROJECT TITLE: Advanced Anti-Radiation Guided**

2. (U) FY 2000 PLAN:

- (U) (\$5,850) Contractor to conduct chamber tests of the software evaluation station/brassboard. Contractor to continue unique AARGM design and commence captive flight test preparation. Contractor to complete control test vehicle integration, testing, and test analysis. Contractor to finalize development of AARGM prototype, to include hardware/software design upgrades, subsystems assembly and test, prototype integration and testing, and prototype captive carry test.
- (U) (\$3,950) Field activity to provide AARGM system engineering support of development and systems integration efforts. Continue weapon system testing studies to assess weapons technology performance and deficiencies.
- (U) (\$800) Contractor to perform program management and engineering services in support of the AARGM technology demonstration program. Provide technical management support and coordination of AARGM Program weapons system technology studies.
- (U) (\$100) Continue Government technical management, engineering support, and coordination of AARGM Program weapons system technology development program.
- (U) (\$15,000) Contractor to continue risk reduction activities. Activities include performance and affordability enhancements of the Anti-Radiation Homing (ARH) receiver, the MillimeterWave (MMW) Radar Transceiver, the Low-Band Antenna Array Receiver. Related efforts include radome material trade studies, aircraft integration studies, tactical software enhancements, and tactical sensitivity and Electro-Magnetic Interference (EMI) enhancements.

3. (U) FY 2001 PLAN:

- (U) (\$4,800) Contractor to complete captive flight testing of the AARGM brassboard. Contractor to complete guided test vehicle integration, testing, and test analysis. Contractor to complete development of AARGM prototype Guided Test Vehicle, to include hardware/software design upgrades, subsystems assembly and test, prototype integration and testing, and prototype captive carry test and data analysis.
- (U) (\$3,279) Field activity to complete AARGM system engineering support of development and systems integration efforts. Complete weapon system testing studies to assess weapons technology performance and deficiencies.
- (U) (\$800) Contractor to perform program management and engineering services in support of the AARGM technology demonstration program. Provide technical management support and coordination of AARGM Program weapons system technology studies.
- (U) (\$100) Complete Government technical management, engineering support, and coordination of AARGM Program weapons system technology development program.

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**EXHIBIT R-2a, FY 2001 RDT&E,N BUDGET PROJECT JUSTIFICATION SHEET**

**DATE: February 2000**

**BUDGET ACTIVITY: 7      PROGRAM ELEMENT: 0205601N**  
**PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185**  
**PROJECT TITLE: Advanced Anti-Radiation Guided**  
**Missile(AARGM)**

**( U ) B. PROGRAM CHANGE SUMMARY**

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
(U) FY 2000 President's Budget:	22,428	10,843	7,873
(U) Appropriated Value:	22,480	25,843	0
(U) Adjustments from Pres Budget:	-1,943	14,857	1,106
(U) FY 2001 President's Budget Submit:	20,485	25,700	8,979

**CHANGE SUMMARY EXPLANATION:**

**(U) Funding:**

The FY 1999 net decrease of \$1,943 thousand reflects a \$597 thousand reduction for a Small Business Innovative Research assessment, a \$1,217 thousand reduction for a reprioritization of requirements within the Navy, a \$26 thousand reduction for lapsed liabilities on contracts, and a \$103 thousand decrease for revised economic assumptions.

The FY2000 net increase of \$14,857 reflects a \$15,000 thousand increase for a Congressional Add and a \$143 thousand decrease for an Across-the-Board Congressional rescission.

The FY 2001 net increase of \$1,106 thousand reflects an increase of \$1,200 thousand for the AARGM program, a reduction of \$42 thousand for revised economic assumptions, and a reduction of \$52 thousand for a reprioritization of requirements within the Navy.

(U) Schedule: No changes

(U) Technical: No changes

**(U) C. OTHER PROGRAM FUNDING SUMMARY**

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DATE: February 2000

**BUDGET ACTIVITY: 7    PROGRAM ELEMENT: 0205601N**  
**PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185**  
**PROJECT TITLE: Advanced Anti-Radiation Guided**  
**Missile(AARGM)**

(U) D. ACQUISITION STRATEGY:

The HARM AARGM program is an advanced technology demonstration program. AARGM started as a Phase I Small Business Innovative Research (SBIR) program and has evolved into a Phase III SBIR program. The acquisition strategy for the AARGM Program is based upon U.S. Navy operational requirements; the AARGM program is driven by the conclusion derived from an Analysis of Alternatives for advanced Suppression of Enemy Air Defenses (SEAD) technology. Current acquisition strategy is consistent with the FY98 independent program review forwarded to Congress by SECNAV and the FY99 Authorization Report. The innovative research AARGM demonstration is fully funded and executable and will result in fabrication of research articles and limited flight testing of the AARGM dual mode seeker with moderate risk. The U.S. Navy Project Manager is responsible for Program management and execution. AARGM's acquisition strategy delineates Industry and Government responsibilities. The contract strategy (i.e. software evaluation, control test vehicle development and testing, guided test vehicle development and testing) assigns work package tasks to a primary contractor, Science and Applied Technology (SAT) Corp. The SAT contract is funded on an incremental basis with work scope defined in contract options and contract modification statements of work. Government responsibilities include monitoring, technical assessment and validation of contractor technology development. The AARGM technology demonstration is expected to be completed by the end of FY01.

(U) E. SCHEDULE PROFILE:

The AARGM program is an Advanced Technology Program and therefore does not have a standard detailed Milestone Plan. A list of key actions appears below.

AARGM PROGRAM	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY2001</u>
Software Evaluation Station/Brassboard			
Hardware/Software Development	Continue 1Q/99	Complete 1Q/00	
Subsystems Assembly and Test	Complete 4Q/99		
Seeker Integration/Test	Complete 4Q/99		
Chamber Tests	Begin 4Q/99	Complete 1Q/00	
Brassboard Captive Flight Tests (CFTs)			
Unique Design and CFT Preparation	Continue	Complete 1Q/00	
Contractor Managed Testing		1Q/00	
Captive Flight Testing		Begin 3Q/00	Complete 3Q/01

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**BUDGET ACTIVITY: 7    PROGRAM ELEMENT: 0205601N**  
**PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2185**  
**PROJECT TITLE: Advanced Anti-Radiation Guided Missile(AARGM)**

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY2001</u>	<u>To Complete</u>
AARGM Program Cont'd				
Control Test Vehicles (CTVs)				
Unique Hardware/Software Development				
Subsystems Assembly and Test	Complete 1Q/99			
Integration and Test	Begin 1Q/99	Complete 2Q/00		
CTV Flights Test and Analysis		Begin 1Q/00		
		Complete 3Q/00		
Prototype				
Hardware/Software Design Upgrades	Continue	Complete 1Q/00		
Subsystems Assembly and Test		Complete 1Q/00		
Integration and Testing	Begin 2Q/99	Complete 4Q/00		
Captive Carry Test		4Q/00		
Guided Test Vehicles (GTVs)				
Hardware/Software Design Upgrades	Continue	Continue		Complete 3Q/01
Subsystems Assembly and Test	Continue	Continue		Complete 3Q/01
Integration and Test		Begin 1Q/00		Complete 4Q/01
GTV Live Fire Test and Analysis				4Q01
Contractor design and trade studies	2Q/99 – 4Q/00			
System engineering support	2Q/99 – 4Q/00			

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DATE: February 2000

BUDGET ACTIVITY: 7

PROGRAM ELEMENT: 0205601N  
PE Title: HARM Improvement

PROJECT NUMBER: E2185  
PROJECT TITLE: Advanced Anti-Radiation Guided  
Missile (AARGM)

<u>Cost Categories:</u>	<u>Contract Method &amp; Type</u>	<u>Performing Activity &amp; Location</u>	<u>Total Prior Yrs Cost</u>	<u>FY 1999 Cost</u>	<u>FY 1999 Award Date</u>	<u>FY 2000 Cost</u>	<u>FY 2000 Award Date</u>	<u>FY 2001 Cost</u>	<u>FY 2001 Award Date</u>	<u>Cost to Complete</u>	<u>Total Cost</u>	<u>Target Value of Contract</u>
<b>Product Development</b>												
AARGM Adv Technology Development	CPFF	SAT, Woodland Hills, CA	59327	7040	Jan 99	5850	Jan 00	4800	Jan 01	0	77017	77017
AARGM Engineering Support	WX	NAWC WD, China Lake	4486	1596	Oct 98	3950	Oct 99	3279	Oct 00	0	13311	
AARGM Engineering/Tech Assessment	CPIF	JHU/APL, MD	615	0	N/A	0	N/A	0	N/A	0	615	615
AARGM Risk Reduction	CPFF	SAT, Woodland Hills, CA	0	8805	Jul 99	15000	Feb 00	0	N/A	0	23805	23805
AARGM Engineering Support	WX	NAWC WD China Lake	0	2120	Feb 99	0	N/A	0	N/A	0	2120	
<b>Subtotal Product Development</b>			<b>64428</b>	<b>19561</b>		<b>24800</b>		<b>8079</b>		<b>0</b>	<b>116868</b>	<b>101437</b>

Remarks:

**Support**

<b>Subtotal Support</b>			<b>0</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>
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Remarks:

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 EXHIBIT R-3, FY 2001 RDT&E,N COST ANALYSIS

DATE: February 2000

BUDGET ACTIVITY: 7

PROGRAM ELEMENT: 205601N  
 PE TITLE: HARM Improvement

PROJECT NUMBER: E2185  
 PROJECT TITLE: Advanced Anti-Radiation Guided  
 Missile (AARGM)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total Prior Yrs Cost	FY 1999 Cost	FY 1999 Award Date	FY 2000 Cost	FY 2000 Award Date	FY 2001 Cost	FY 2001 Award Date	Cost to Complete	Total Cost	Target Value of Contract
Test & Evaluation												
<b>Subtotal Test &amp; Evaluation</b>			<b>0</b>	<b>0</b>		<b>0</b>		<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>
<b>Remarks:</b>												
<b>Management</b>												
Travel	WX	NAWC AD, Patuxent MD	100	100	Oct 98	100	Oct 99	100	Oct 01	0	400	
Technical Assessment/Mgmt Support	RX/LOE	DCS, Alex VA	905	824	Dec 98	800	Jan 00	800	Dec 01	0	3329	3329
<b>Subtotal Management</b>			<b>1005</b>	<b>924</b>		<b>900</b>		<b>900</b>		<b>0</b>	<b>3729</b>	<b>3329</b>
<b>Remarks:</b>												
<b>Remarks:</b>												
<b>Total Cost</b>			<b>65433</b>	<b>20485</b>		<b>25700</b>		<b>8979</b>		<b>0</b>	<b>120597</b>	<b>104766</b>

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**DATE: February 2000**

**BUDGET ACTIVITY: 7**

**PROGRAM ELEMENT: 0205601N  
PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2211  
PROJECT TITLE: JAWS**

(U) COST: (Dollars in Thousands)

<u>Project Number &amp; Title</u>	<u>FY 1999 Budget</u>	<u>FY 2000 Estimate</u>	<u>FY 2001 Estimate</u>	<u>FY 2002 Estimate</u>	<u>FY 2003 Estimate</u>	<u>FY 2004 Estimate</u>	<u>FY 2005 Estimate</u>	<u>To Complete</u>	<u>Total Program</u>
E2211 Joint Advanced Weapons Systems (JAWS)	927	1,467	2907	3,819	3,778	3,744	3,737	0	23,135
<b>TOTAL</b>	<b>927</b>	<b>1,467</b>	<b>2907</b>	<b>3,819</b>	<b>3,778</b>	<b>3,744</b>	<b>3,737</b>	<b>0</b>	<b>23,135</b>

Quantity of RDT&E Articles

(U) A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: The Joint Advanced Weapon System (JAWS) is the joint service multi-role follow-on weapon system for the current TOW and Hellfire missiles, to support Army and USMC Mission Need Statements (MNS) for weapon requirements for the post-2000 force structure. DON JAWS efforts support joint trade studies, Analysis of Alternatives (AOA), and the development of emerging programs' Milestone 0 documentation. Through Memorandums of Understanding (MOU), the Army is assigned as the lead service. Development programs include The Army Combined Arms Weapon System (TACAWS), the Advanced Missile System-Heavy (AMS-H), the Advanced Precision Kill Weapon System (APKWS) guided rocket, and component upgrades to the currently deployed missile systems. The DON participates in technology modeling and simulation efforts at the Army's Advanced Prototyping, Engineering, and experimentation (APEX) Laboratory. This modeling supports hardware development efforts such as the Future Missile Technology Integration (FMTI) program, to explore advanced guidance, propulsion, and motor capabilities desired by the services. As a simulator, the APEX Lab also assists in developing potential Tactics, Techniques, and Procedures (TTPs), and in operationally validating the requirements set out in the MNS and the ORD. All JAWS efforts support the services' requirements for state-of-the-art capabilities to complement the next generation of aircraft and to defeat the threats of the post-2000 battlefield.

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**BUDGET ACTIVITY: 7**

**PROGRAM ELEMENT: 0205601N**  
**PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2211**  
**PROJECT TITLE: JAWS**

**( U ) PROGRAM ACCOMPLISHMENTS AND PLANS:**

**1. FY 1999 ACCOMPLISHMENTS**

- (U) (\$927) APEX Lab operated and evaluated of Military Operations in Urban Terrain (MOUT), to support USMC requirements for the JAWS to perform in Close Air Support roles in urban areas. Evaluated APKWS guided rocket and potential component upgrades and aircraft integration issues for the current Hellfire missile (\$530K Army and \$397K Government In-house).

**2. FY 2000 PLAN:**

- (U) (\$1,467) Expand APEX evaluation of MOUT operations, as well as incorporation of fixed wing parameters into the APEX model. Evaluation to include Joint Strike Fighter as Modernized Hellfire platform. Continue flight demonstrations/evaluations of advanced guided rocket APKWS (Advanced Precision Kill Weapon System). Evaluate component hardware upgrade potentials for the Hellfire missile. Prove selected technologies meet/fulfill multi-mission requirements set by APKWS and Modernized Hellfire ORD. Continue to examine developing motor, warhead, guidance, and control technologies. (\$850K Army and \$617K government in-house).

**3. FY 2001 PLAN:**

- (U) (\$2,907) Continue APEX evaluation of fixed and rotary wing Modernized Hellfire ORD requirements. Validate that developing technologies are driven by and meet ORD requirements for guided rocket/missile motors, warheads, guidance and control sections, and launchers. Continue evaluation of hardware technology for Modernized Hellfire, APKWS, and Hellfire upgrades. Continue flight demonstrations for Modernized Hellfire, the APKWS guided rocket, and current Hellfire missile upgrade efforts. Evaluate aircraft integration issues associated with proposed weapon systems (\$1,500K Army and \$1,407K government in-house).

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BUDGET ACTIVITY: 7

PROGRAM ELEMENT: 0205601N  
PROGRAM ELEMENT TITLE: HARM Improvement

PROJECT NUMBER: E2211  
PROJECT TITLE: JAWS

A. PROGRAM CHANGE SUMMARY:

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
(U) FY 2000 President's Budget:	956	1476	2950
(U) Appropriated Value:	993	1476	
(U) Adjustment from Pres Budget Submit:	-29	-9	-43
(U) FY 2001 President's Budget Submit:	927	467	2907

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: The FY 1999 decrease of \$29 thousand is due to a SBIR assessment, inflation savings and Below Threshold Reprogrammings (BTRs).  
The FY 2000 decrease of reflects a \$9 thousand reduction for an Across-the-Board Congressional Recision.  
The FY 2001 net decrease of \$43 thousand reflects a \$24 thousand decrease for revised economic assumptions and a decrease of \$19 thousand for a reprioritization of requirements within the Navy.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

B. OTHER PROGRAM FUNDING SUMMARY: Not applicable.

RELATED RDT&E: U.S. Army P.E. 0603313A PROJ D263 Future Missile Technology Insertion (FMTI).

C. ACQUISITION STRATEGY: Not an ACAT program with no specific acquisition strategy.

D. SCHEDULE PROFILE: Not applicable.

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EXHIBIT R-3, FY 2001 RDT&E,N COST ANALYSIS

DATE: February 2000

**BUDGET ACTIVITY: 7**

**PROGRAM ELEMENT: 0205601N  
PROGRAM ELEMENT TITLE: HARM Improvement**

**PROJECT NUMBER: E2211  
PROJECT TITLE: JAWS**

<u>Cost Categories:</u>	<u>Contract Method &amp; Type</u>	<u>Performing Activity &amp; Location</u>	<u>Total Prior Yrs Cost</u>	<u>FY 1999 Cost</u>	<u>FY 1999 Award Date</u>	<u>FY 2000 Cost</u>	<u>FY 2000 Award Date</u>	<u>FY 2001 Cost</u>	<u>FY 2001 Award Date</u>	<u>Cost to Complete</u>	<u>Total Cost</u>	<u>Target Value of Contract</u>
<b>Product Development</b>												
LCPK	MIPR	MICOM		80	MAR 00						80	
APEX	MIPR	MICOM	1965	450	NOV 98	850	FEB 00	1500	NOV 00	6459	11224	
<b>Subtotal Product Development</b>			<b>1965</b>	<b>530</b>		<b>850</b>		<b>1500</b>		<b>6459</b>	<b>11304</b>	
<b>Support</b>												
LCPK Studies	MIPR	MICOM		50	DEC 99						50	50
Mission Grips	IPR	GSA		35	FEB 00						35	35
Engineering Technical Services	C/TMM	DCS Corp	332	215	JAN 99	200	FEB 00	400	JAN 01	1985	3132	3132
<b>Subtotal Support</b>			<b>332</b>	<b>300</b>		<b>200</b>		<b>400</b>		<b>1985</b>	<b>3217</b>	<b>3217</b>
<b>Test and Evaluation</b>												
Testing	WX	CHINA LAKE	382	62	NOV 98	377	JAN 00	971	NOV 00	6490	8282	3
Phototelesis	MIPR	FORT EUSTIS	29								29	
<b>Subtotal Test &amp; Evaluation</b>			<b>411</b>	<b>62</b>		<b>377</b>		<b>971</b>		<b>6490</b>	<b>8311</b>	
<b>Management</b>												
Travel	WX	NAVAIR	48	32	NOV 98	30	OCT 99	36	NOV 00	144	290	
Travel	MIPR	MICOM		3	NOV 98	10	NOV 99				13	
<b>Subtotal Management</b>			<b>48</b>	<b>35</b>		<b>40</b>		<b>36</b>		<b>144</b>	<b>303</b>	
<b>Total Cost</b>			<b>2756</b>	<b>927</b>		<b>1467</b>		<b>2907</b>		<b>15078</b>	<b>23135</b>	<b>3217</b>

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