MDA RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 2002

BUDGET ACTIVITY: 4 - Program Definition and Risk Reduction

PE NUMBER AND TITLE: 0603875C International Cooperative Programs

COST (*In Thousands*)	FY2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	FY2006 Estimate	FY2007 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	125805	0	0	0	0	0	0	Continuing	Continuing
1161 Advanced Sensor Technology*	33780	0	0	0	0	0	0	Continuing	Continuing
2259 Israeli Cooperative Project	92025	0	0	0	0	0	0	Continuing	Continuing

Beginning in FY2002, funding from this Program Element (PE) is moved to the MDA Program Elements 0603881C and 0603884C to facilitate Ballistic Missile Defense (BMD) system capability evolution, allow timely responses and reactions to changes in the BMD program, and provide the programmatic agility to mitigate unforeseen consequences.

A. Mission Description and Budget Item Justification

This program is in Budget Activity 4 – Demonstration and Validation, Research Category 6.3B. The International Cooperative Program Element (PE) was created at Congressional direction. This PE provides for cooperative efforts with Israel and the Russian Federation. Cooperation with Israel centers around the development of an initial capability for the Arrow Missile Defense system that is interoperable with U.S. missile defense forces. The PE also provides for work with the Russian Federation to demonstrate advanced space-based remote sensor technologies and supports other cooperative research.

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY 2002 PB)	116992		
Congressional Adjustments	14000		
Appropriated Value	130992		
Adjustments to Appropriated Value			
a. Congressional General Reductions	-1201		
b. SBIR / STTR	-2857		
c. Omnibus or Other Above Threshold Reductions			
d. INTL Realignment	-1037		
e. Rescissions	-92		
Adjustments to Budget Years Since FY 2002 PB	8813		
Current Budget Submit (FY 2003 Budget Estimates)	125805		

Change Summary Explanation:

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Beginning in FY2002, funding from this Program Element is moved to the MDA Program Elements 0603881C, and 0603884C to facilitate BMD system capability evolution, allow timely responses and reactions to changes in the BMD program, and provide the programmatic agility to mitigate unforeseen consequences.

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BUDGET ACTIVITY 4 - Program Definition and Risk Reduction	PE NUMBER AND TITLE 0603875C International Cooperative Programs
	PROJECT 1161

COST (*In Thousands*)	FY2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	FY2006 Estimate	FY2007 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology*	33780	0	0	0	0	0	0	Continuing	Continuing

A. Mission Description and Budget Item Justification

To prepare for critical future active defense needs, Ballistic Missile Defense Organization (BMDO) will conduct a balanced international cooperative program of high leverage technologies that yield improved capabilities across a selected range of advanced sensors. The objectives of these cooperative investments are subsystems with improved performance and reduced costs for acquisition programs.

Russian-American Cooperative Programs:

- The Russian-American Observation Satellites (RAMOS) program is an innovative U.S.-Russian space-based remote sensor research and development program addressing ballistic missile defense and national security. This program engages Russian developers of early warning satellites in the joint definition and execution of aircraft and space experiments. The program will ultimately design, build, launch, and operate two satellites that will provide stereoscopic observations of the earth's atmosphere and ballistic missile launches in the short wavelength and mid-to-long wavelength infrared bands. Near-term experiments have focused on planning and executing nearly simultaneous observations of Earth features using U.S. and Russian satellites. The final phase of the near-term experiments included the development of U.S. and Russian instruments for proof-of-concept measurements from the Flying Infrared Signatures Technology Aircraft (FISTA).

FY 2001 Planned Program:

•	33481	RAMOS
•	299	OSD Reserve
Total	33780	

B. Other Program Funding Summary	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	To Compl	Total Cost
N/A									

C. Acquisition Strategy:

RAMOS is a cooperative experiment program designed to engage the Russians in early warning and theater missile defense related technologies. The tasks to complete the design, fabrication, launch, and operations of the two-satellite constellation will be completed under three major contracts.

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The first contract is with Utah State University (USU)/Space Dynamics Laboratory (SDL), a designated University Affiliated Research Center for space sensors. SDL is the current U.S. prime contractor for RAMOS and has a prime/subcontractor relationship with the Russian State Company, Rosvoorouzhenie (now Rosoboronexport), for Russian tasks. This contractual approach will be used for design and development of the RAMOS system through the Preliminary Design Review (PDR) scheduled for 2Q FY 2002. After PDR, USU will remain as the prime U.S. contractor for the sensor development and fabrication as well as mission planning and data reduction.

The second contract will be a direct contract with the Russian State Company, Rosoboronexport (formerly Rosvoorouzhenie.) During FY01, BMDO plans to negotiate a government-to-government agreement with the Russian Federation to govern the RAMOS program. Once this agreement is concluded, BMDO will contract directly with Rosoboronexport for the Russian efforts. Under this contract, Rosoboronexport, through Russian subcontractors, will be responsible for the development and fabrication of the satellite platforms, development and operation of the ground system, and launch services for the two RAMOS satellites.

The third contract is with Ball Aerospace and Technologies Corporation of Boulder, CO. As the Systems Engineering and Integration contractor for BMDO, BATC will be primarily responsible for monitoring the Russian effort and facilitating the integration of U.S. and Russian components. Ball will also support preparation of program documentation for technology protection and security and provide in country administrative, security and technical support of RAMOS Program Office.

D. Schedule Profile	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Award Systems Engineering and Integration Contract	2Q						
Complete Systems Specification	2Q						
Complete Systems Requirements Review	2Q						
Conclude Gov't-toGov't agreement	3Q						
Conclude Direct Contract with Russians	3Q						

MDA RDT&E COST ANALYSIS (R-3)

DATE: February 2002

BUDGET ACTIVITY: 4 - Program Definition and Risk Reduction

PE NUMBER AND TITLE: 0603875C International Cooperative Programs

PROJECT: 1161

I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. RAMOS	Various	Air Force, Colorado Springs, CO	281						281	
b. RAMOS	Various	MDA, Various	33200						33200	
c.										
Subtotal Product Development:			33481						33481	

Remark: Prior to FY 1999, the RAMOS program was in BA3 - Advanced Technology Development, PE 0603173C, Support Technologies – ATD. Funding for Rosoboronexport in FY2001 and prior is as a subcontract to USU/SDI.

II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. OSD Reserve	Various	Various	299						299	
Subtotal Support Costs:			299						299	

Remark: Prior to FY 1999, the RAMOS program was in BA3 - Advanced Technology Development, PE 0603173C, Support Technologies – ATD

AFRL technical support will be required in program development, experiment planning and data analysis, with emphasis on earth backgrounds, data certification, technology transfer and surveillance.

III. Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a.										
Subtotal Test and Evaluation:										

Remark:

MDA RDT&E COST ANALYSIS (R-3)

DATE: February 2002

BUDGET ACTIVITY: 4 - Program Definition and Risk Reduction

PE NUMBER AND TITLE: 0603875C International Cooperative Programs

PROJECT: 1161

IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a.										
Subtotal Management Services:										
Project Total Cost:			33780						33780	

Remark: Prior to FY 1999, the RAMOS program was in BA3 - Advanced Technology Development, PE 0603173C, Support Technologies – ATD

MDA RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

DATE: February 2002

BUDGET ACTIVITY: 4 - Program Definition and Risk Reduction

PE NUMBER AND TITLE: 0603875C International Cooperative Programs

PROJECT: 2259

COST (*In Thousands*)	FY2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	FY2006 Estimate	FY2007 Estimate	Cost to Complete	Total Cost
2259 Israeli Cooperative Project	92025	0	0	0	0	0	0	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides funding for the Arrow Deployability Program (ADP) to include the third Arrow battery and Arrow interoperability with U.S. Theater Missile Defense (TMD) systems, as well as the Arrow System Improvement Program (ASIP), Israeli Test Bed (ITB), and the Israeli System Architecture and Integration (ISA&I). The United States derives considerable benefits from its participation in these projects. The presence of a ballistic missile defense system in Israel developed under this project helps ensure U.S. freedom of action in future contingencies and provides protection against ballistic missile attacks to U.S. forces deployed to the region. The cooperative effort also provides risk reduction and alternative technologies for U.S. ballistic missile defense programs as well as phenomenology and kill assessment data.

The ADP consists of efforts to integrate and test the elements making up a ballistic missile defense system for Israel. Under the ADP, the jointly developed Arrow II interceptor and launcher are being integrated with the Israeli developed Arrow components, to include: fire control radar (Green Pine), battle management center (Citron Tree) and launcher control center (Hazelnut Tree). The ADP is the third phase of the cooperative Arrow program. Phase I consisted of the Arrow Experiments project that cooperatively developed the pre-prototype Arrow I interceptor. It was followed by the Arrow Continuation Experiments (ACES) project which consisted of critical lethality and flight tests using the upgraded Arrow II interceptor. The Arrow II interceptor development, now complete, provided the basis for an informed Government of Israel (GOI) engineering and manufacturing decision to proceed with development of an integrated ballistic missile defense capability. ACES was highly successful and satisfied the Israeli requirement for a ballistic missile interceptor for defense of Israeli critical assets and population centers. The phase II program contributed to the U.S. technology base for new advanced ballistic missile defense technologies that were incorporated into the U.S. TMD systems, and also provided risk reduction technologies in the event that U.S. TMD technical efforts failed to meet expectations.

The third phase is the current ADP, which began in FY 1996. This phase of the program provides for development, test, and deployment of an Arrow User Operational Evaluation System (UOES) to permit the Government of Israel to make a decision regarding its deployment (without financial participation by the United States beyond the Research and Development (R&D) stage). This effort includes integrated system-level flight tests of the total Arrow Weapon System (AWS). The first such integrated intercept flight test was successfully conducted in Israel on November 1, 1999. The Green Pine radar detected a Scud-class ballistic target, and the Citron Tree battle management center commanded the launch of the Arrow II interceptor and communicated with it in-flight to successfully destroy the incoming missile. A second ADP intercept flight test, conducted on September 14, 2000, was the first intercept of an airlaunched Black Sparrow ballistic target. In this intercept test, the target was flown toward Israel making this the first Arrow intercept of an incoming target vice past intercept test wherein the target was flown away from Israel.

The International Agreement (IA) between the U.S. and Israel for the ADP will be amended to provide additional funding of $34M in FY 2002 for the Arrow third battery. In January 1998, Israel requested $169 million to fund the procurement of a third Arrow battery. Congress provided a plus-up of $45M in FY98 and a second $45M plus-up in FY00. DoD requested, and Congress appropriated, third battery funding of $45M in FY 2001. For each third battery installment, Congress authorized

the ADP IA to be amended to increase the U.S. cost share and allow Israel to withdraw an equal to acquire components of the third battery. Of the total $169M requested by Israel in January 1998 for the third Arrow battery, a balance of $34 M now remains. DoD has programmed that amount in FY 2002 as the final installment, which will then complete the U.S. commitment.

Arrow is being made interoperable with U.S. TMD systems using the Joint Tactical Information Distribution Systems (JTIDS)/Link-16 communications architecture and message protocol. An interface has now been developed and delivered in Israel for AWS interoperability. Early proof-of-concept tests using the BMDO-developed TMD System Exerciser (TMDSE) have been conducted via interactive simulation exercises to lay the foundation for future test, assessment, and validation of the JTIDS-based interoperability between the AWS and U.S. TMD systems. The TMDSE experiments, to be largely completed in FY 2001, will assess AWS operability with deployed U.S. TMD systems. The interoperability effort will be funded in FY 2001 by a $6M Congressional add-on which also pays back Israeli money which funded the effort in FY 2000.

An Arrow System Improvement Program (ASIP) feasibility study will be conducted in FY 2001 to explore ways to maintain the Arrow's capability against emerging regional threats, including countermeasures and longer range ballistic missiles. This effort will be funded in FY 2001 by an $8M Congressional add-on. The United States and Israel will determine, at the conclusion of the feasibility study, whether the ASIP is technically mature to proceed to the next ASIP phase. ASIP, if shown to be feasible, would be conducted in three phases. Phase I, a 9-12 month feasibility study, will be conducted during FY 2001 and will provide a determination concerning feasibility of upgrading the Arrow Weapon System and a detailed plan if shown to be feasible.

Since Arrow program initiation in 1988, Israel successfully improved the performance of its pre-prototype Arrow I interceptor to the point that it achieved a successful intercept and target destruction in June 1994. Arrow II design and component testing progressed to the successful demonstration of the new warhead, electro-optical seeker, radar fuse, first stage booster, sustainer booster, launcher canister, and launcher. The ADP IA was signed in March 1996, and Presidential certification was completed in May 1996. Under the ADP agreement, the first flight test of the integrated AWS, a non-intercept fly-out test, was successfully completed on September 14, 1998. This was a combined ACES/ADP flight test, and its success marked the conclusion of the ACES Program. This flight test was the first in which the other elements of the AWS, rather than test range assets, were used to control and communicate in-flight with the Arrow missile. This test demonstrated the technical maturity of the AWS and was followed by a successful integrated system intercept test against a ballistic missile target on November 1, 1999. Following the successful intercept of an incoming Black Sparrow target on September 14, 2000, the Israeli Air Force declared the Arrow Weapon System operational on October 16, 2000.

The ITB Program is a medium-to-high fidelity theater missile defense simulation that provides the capability to evaluate potential Israeli missile defenses, aids the Israeli Ministry of Defense (IMoD) in the decision of which defense systems to field, provides insights into command and control in TMD and the role of Human-in-the-Loop (HIL), and trains Israeli Air Force personnel to function in a TMD environment. A structured set of joint U.S./Israeli experiments is being executed to evaluate the role of missile defenses in Middle East theater operations. This funding also provides for a portion of the operation and maintenance of the ITB and for planned enhancements. The implementation of the Distributed Interactive Simulation (DIS) and high level architecture (HLA) technologies enables joint exercise experiments to be conducted both in Israel and across the water between U.S. TMD and Israeli TMD systems, using a combination of such modeling and simulation tools as the Extended Air Defense Simulation (EADSIM), Extended Air Defense Test Bed (EADTB), and the ITB.

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ITB experiments are used to validate the performance of the prospective near-term Israeli Theater Missile Defense System and provide valuable insight into the potential role of HIL for a TMD system. The ITB is being used as a tool to assist with the development of Combined Standard Operating Procedures (CSOP) between the U.S. European Command (USEUCOM) and Israel for potential combined TMD operations. Early warfighter activities in developing the CSOP at the ITB were invaluable during U.S. contingency operations in late FY 1998. Further ITB experiments involving the Israeli Air Force and USEUCOM were undertaken in FY 2000 and FY 2001 to finalize combined operating procedures and to begin the integration of the AWS in USEUCOM'S CSOP and Operations Plan (OPLAN).

The ISA&I tasks provide ongoing analysis and assessment of the baseline, evolutionary, and responsive threats to support the definition and evaluation of an initial Israeli Reference Missile Architecture (IRMA), a baseline missile configuration from which to assess and evaluate architectural effectiveness. Evolutionary growth paths to enhance the IRMA robustness against future threats are being identified. Critical TMD system architecture issues and technologies are being analyzed, and the conformance to established requirements of various TMD programs, including the Arrow Deployability Program (ADP), Boost Phase Intercept concepts, and the ITB are being conducted. Finally, previously developed simulations and models are being used selectively to address significant TMD issues. Collectively, the tasks conducted under this cooperatively sponsored ISA&I project provide critical insights and technical data to both the U.S. and Israeli governments for improving near-term and evolutionary defenses against ballistic missile threats.

The ISA&I project activities have demonstrated that defense of the State of Israel from Theater Ballistic Missile (TBM) attacks is necessary, feasible, and cost-effective. The ISA&I effort analyzed and addressed numerous TMD system issues including HIL, resource allocation, and threat analysis. The United States benefited from the architecture analysis work, including identification and progress toward resolution of critical TMD system issues such as kill assessment and the lethality study of a novel interceptor warhead. The ISA&I is playing a critical role in identifying possible AWS upgrades to preserve system effectiveness as more robust regional ballistic missile threats continue to evolve.

The cooperative R&D program supports the advancement of emerging TMD technologies. The IMoD and the BMDO will jointly measure the phenomenology and kinematics of theater ballistic missile systems.

FY 2001 Planned Program:

- 28806 ARROW DEPLOY PROJ (ADP)
- 3079 ADP SUPPORT
- 1300 ISRAELI COOP R&D
- 2100 ISRAELI TEST BED
- 1849 ISRAELI SE&I
- 1656 INTEROPERABLTY VALIDATION
- 45000 ARROW 3RD BTRY
- 100 F/B MTL
- 6200 ASIP

BMDO RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 2002
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- 1800 ASIP Support
- 135 GOV PROJECT PER & SUPT

Total 92025

B. Other Program Funding Summary	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	To Compl	Total Cost
N/A									

C. Acquisition Strategy: This is an ongoing cooperative U.S./GOI development program. By completing the Arrow Deployability Program, U.S. TMD programs will be afforded state-of-the-art technical data for program risk reduction and the Government of Israel will have developed a robust AWS to defend against known regional ballistic missile threats. Through the ADP, Link-16-based interoperability between the AWS and U.S. TMD systems will be achieved. The United States and the Government of Israel, under the umbrella of the various Memoranda of Agreements, share project costs. The U.S. share of total funding is based upon the maturity of the development. The ADP will be completed in FY2002. The Government of Israel will continue to fund the acquisition of Arrow Weapon System components beyond FY 2002. The Government of Israel is interested in continuing missile defense cooperation beyond the Arrow Deployability Program. The Arrow System Improvement Program feasibility study was funded via a Congressional $8M plus-up in FY 2001 and the final results of that study will provide a basis for assessing the viability of a follow-on FY 2002-2007 cooperative missile defense program.

D. Schedule Profile	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Arrow Weapon System Flight Tests	3Q						
Conduct TMDSE Proof-Of-Concept Test II	2Q						
Initiate Interoperability Tests w/ U.S. TMDSE	2Q						
Complete ASIP Feasibility Study	4Q						

MDA RDT&E COST ANALYSIS (R-3)

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I. Product Development	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. ARROW DEPLOY PROJ (ADP)	Various	Various	28806						28806	
b. ISRAELI COOP R&D	Various	Various	1300						1300	
c. ISRAELI TEST BED	Various	Various	2100						2100	
d. ISRAELI SE&I	Various	Various	1849						1849	
e. INTEROPERABLTY VALIDATION	Various	Various	1656						1656	
f. ARROW 3RD BTRY	Various	Various	45000						45000	
g. F/B MTL	Various	Various	100						100	
h. ASIP	Various	Various	6200						6200	
Subtotal Product Development:			87011						87011	

Remark:

II. Support Costs	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a. ADP SUPPORT	Various	Various	3079						3079	
b. ASIP Support	Various	Various	1800						1800	
c. GOV PROJECT PER & SUPT	Allot	SMDC, Huntsville, Al	135						135	
Subtotal Support Costs:			5014						5014	

Remark:

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III. Test and Evaluation	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a.										
Subtotal Test and Evaluation:										

Remark:

IV. Management Services	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2002 Cost	FY 2002 Award Date	FY 2003 Cost	FY 2003 Award Date	Cost To Complete	Total Cost	Target Value of Contract
a.										
Subtotal Management Services:										

Remark:

Project Total Cost:			92025						92025	

Remark: