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| Exhibit R-2, RDT&E Budget Item Justification             |         |         |         |   | Date: February 2004 |         |         |               |
|--|---------|---------|---------|---|---------------------|---------|---------|---------------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE<br>JOINT ROBOTICS<br>PROGRAM |                     |         |         | PE 0603709D8Z |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007             | FY 2008 | FY 2009 |               |
| Total PE Cost-   | 19.235  | 15.784  | 11.771  | 11.907  | 12.145              | 11.828  | 12.142  |               |
| JOINT SERVICE EOD  | 3.100   | 2.500   | 0.810   | 0.820   | 0.840               | 0.814   | 0.814   |               |
| J AUS  | 1.000   | 1.400   | 0.856   | 1.086   | 1.096               | 1.199   | 1.357   |               |
| GLADIATOR  | 3.125   | 1.140   | 1.140   | 1.152   | 1.220               | 1.090   | 1.211   |               |
| RCSS   | 2.318   | 1.058   | 1.060   | 1.100   | 1.120               | 1.094   | 1.120   |               |
| NUSE 2   | 0.000   | 2.100   | 1.065   | 1.100   | 1.123               | 1.090   | 1.120   |               |
| INTELLIGENT MOBILITY                                     | 1.200   | 1.000   | 1.120   | 1.139   | 1.420               | 1.261   | 1.230   |               |
| RACS   | 5.200   | 4.500   | 5.520   | 5.310   | 5.326               | 5.280   | 5.290   |               |
| COTS   | 3.292   | 2.086   | 0.200   | 0.200   | 0.000               | 0.000   | 0.000   |               |

**A. Mission Description and Budget Item Justification:**

This program is a budget activity level 4 based on the concept/technology development activities ongoing within the program. This PE was established in response to Congressional guidance to consolidate DoD robotic programs on unmanned ground systems and related robotic technologies in order to increase focus of the Services' robotic programs on operational requirements. The program ensures coordination between the Services and provides for interoperability and commonality among unmanned ground systems. The Joint Robotics Program (JRP) will develop and field a family of affordable and effective mobile ground robotic systems; develop and transition technologies necessary to meet evolving user requirements, and serve as a catalyst for insertion of robotic systems and technologies into the force structure. Unmanned Ground Systems are now realizing the often foreseen potential to provide our service men and women with the leap-ahead warfighting capability they need to reduce risk levels to our personnel. The war on terrorism has created urgent and compelling requirements for UGVs. The JRP has responded by deploying unmanned countermine and reconnaissance systems to Bosnia and Kosovo and in support of Operation Enduring Freedom and Operation Iraqi Freedom. The JRP continues to support UGV deployments around the globe providing the Services with unmanned force

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protection and countermine capabilities. Increasing Service UGV demand and positive feedback from users in the field have validated the JRP mission.

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**B. Program Change Summary:** The Program was transferred by direction of Congress from the Department of the Air Force to the Department of Defense for FY 2004 execution.

|                                    | <u>FY 2003</u> | <u>FY 2004</u> | <u>FY 2005</u> |
|------------------------------------|----------------|----------------|----------------|
| Previous President's Budget        | 19.943         | 11.515         | 11.791         |
| Current FY 2005 President's Budget | 19.235         | 15.784         | 11.771         |
| Total Adjustments                  | -.708          | +4.269         | -.020          |
| Congressional program reductions   |                |                |                |
| Congressional rescissions          | -.708          |                | -.020          |
| Congressional increases            |                | +4.269         |                |
| Reprogrammings                     |                |                |                |
| SBIR/STTR Transfer                 |                |                |                |

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

This program's acquisition strategy continues to maintain two tracks: (1) to develop and field first generation UGVs with current technologies, and (2) pursue advanced technologies critical to semi-autonomous mobility that can be inserted into first generation systems in an evolutionary manner.

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| Joint Service EOD  | 3.100   | 2.500   | 0.810   | 0.820   | 0.840   | 0.814               | 0.814   |

**A. Mission Description and Budget Item Justification:**

This program office is responsible for the lifecycle management of EOD equipment for all four military Services. This particular project will conduct Concept and Technology Development efforts to determine maturity of existing technology and exploration of new concepts to meet EOD requirements. All four Services have the Remote Ordnance Neutralization System (RONS) fielded with their EOD users, and this program includes the RONS Continuous Improvement Program to identify, develop, and qualify improvements to the system. The Joint EOD community has a requirement for a small Man Transportable Robotic System that can conduct EOD tasks to include the use of a manipulator arm to render safe or neutralize unexploded ordnance in confined areas that current systems have difficulty accessing. Also, the Joint EOD community needs increased autonomy in its robotic platforms, and cooperative control of the different classes of robots, and these needs are addressed in this project. The acquisition strategy for Joint Service EOD Robotics includes the conduct of an Analysis of Alternatives by the Joint users, development of a requirements document by the Joint Users, competitive solicitation of a development contract, with built-in options for production, upgrades, support and spare parts. Each Service individually funds for their production, upgrade, support, and spares.

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 3.100   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Took delivery of MTRS Performance Specification Verification Models.

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- Initiated government testing and evaluation of MTRS Performance Specification Verification Models.
- Took delivery of, and evaluated, Semi-Autonomous Remote Ordnance Neutralization System prototype.

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 2.500   | 0.810   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Order MTRS Production Representative Models and conduct final government testing..
- Achieve Production Decision for the MTRS AAP, and transition to Production Phase for the four Services.
- Initiate block upgrade development in accordance with the MTRS evolutionary acquisition approach.
- Demonstrate improved manipulation capability on prototype Semi-Autonomous RONS.
- Complete RONS Continuous Improvement Program project for PC-based electronics and develop additional Semi-Autonomous RONS capabilities.
- Execute user-prioritized RONS Continuous Improvement projects.

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

Not Applicable

**E. Major Performers:**

Not Applicable

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| <b>Exhibit R-3 Cost Analysis (page 1)</b>                          |                              |                                      |                                  |              |                       |              | Date:                 |              | February 2004         |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | Joint Service EOD     |              |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>Cost                    | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| Primary Hardware Development                                       |                              |                                      |                                  | 1.500        |                       | 1.960        |                       | 0.250        |                       |                     |               |                                |  |
| Ancillary Hardware Development                                     |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Systems Engineering  |                              |                                      |                                  | 0.210        |                       | 0.250        |                       | 0.250        |                       |                     |               |                                |  |
| Licenses   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Tooling  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Award Fees   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Subtotal Product Development                                       |                              |                                      |                                  | 1.710        |                       | 2.210        |                       | 0.500        |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Development Support  |                              |                                      |                                  | 0.100        |                       | 0.100        |                       | 0.100        |                       |                     |               |                                |  |
| Software Development   |                              |                                      |                                  | 0.500        |                       | 0.100        |                       | 0.100        |                       |                     |               |                                |  |
| Training Development   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Integrated Logistics Support                                       |                              |                                      |                                  | 0.300        |                       |              |                       |              |                       |                     |               |                                |  |
| Configuration Management   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Technical Data   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |
| Subtotal Support   |                              |                                      |                                  | 0.900        |                       | 0.200        |                       | 0.200        |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |  |

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| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |
|--|------------------------------|--------------------------------------|----------------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------------|---------------|--------------------------------|
| DT   |                              |                                      |                      | 0.100        |                       | 0.090        |                       | 0.110        |                       |                     |               |                                |
| IOT&E  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Initial Verification Testing                                       |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
|  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
|  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
|  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal T&E   |                              |                                      |                      | 0.100        |                       | 0.090        |                       | 0.110        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Contractor Engineering Support                                     |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Government Engineering Support                                     |                              |                                      |                      | 0.200        |                       |              |                       |              |                       |                     |               |                                |
| Program Management Support   |                              |                                      |                      | 0.190        |                       |              |                       |              |                       |                     |               |                                |
| Program Management Personnel                                       |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Travel   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Labor (Research Personnel)   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Miscellaneous  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal Management  |                              |                                      |                      | 0.390        |                       | 0.000        |                       | 0.000        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Total Cost   |                              |                                      |                      | 3.100        |                       | 2.500        |                       | 0.810        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |

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| Exhibit R-4, Schedule Profile                               |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   | Date: February 2004                          |      |   |   |   |      |   |   |   |      |   |   |   |
|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|--|------|---|---|---|------|---|---|---|------|---|---|---|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |      |   |   |   |      |   |   |   |      |   |   | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |      |   |   |   |      |   |   |   |      |   |   | Project Number and Name<br>Joint Service EOD |      |   |   |   |      |   |   |   |      |   |   |   |
| Fiscal Year   | 2001 |   |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |   | 2006 |   |   |  | 2007 |   |   |   | 2008 |   |   |   | 2009 |   |   |   |
|   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4  | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |
| MTRS<br>PSVM T&E  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |  |      |   |   |   |      |   |   |   |      |   |   |   |
| MTRS<br>PRM T&E   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |  |      |   |   |   |      |   |   |   |      |   |   |   |
| MTRS<br>AAP<br>PROD DEC                                     |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |  |      |   |   |   |      |   |   |   |      |   |   |   |
| RONS<br>CIP   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |  |      |   |   |   |      |   |   |   |      |   |   |   |

R-4 Schedule Profile



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| Exhibit R-4a, Schedule Detail                               |         |  |        | Date: February 2004 |  |        |        |        |
|---|---------|--|--------|---------------------|--|--------|--------|--------|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |         | Program Element Number and Name<br>PE 0603708DZ Joint Robotics Program |        |                     | Project Number and Name<br>Joint Service EOD |        |        |        |
|   | FY 2001 | FY 2002  | FY2003 | FY2004              | FY2005                                       | FY2006 | FY2007 | FY2008 |
| MTRS PSVM T&E   |         |  | 3-4Q   | 1-2Q                |  |        |        |        |
| MTRS PRM T&E  |         |  |        | 3-4Q                | 1Q   |        |        |        |
| MTRS AAP PROD DEC   |         |  |        |                     | 1Q   |        |        |        |
| RONS CIP  |         |  | Cont.  | Cont.               | Cont.  | Cont.  |        |        |

R-4a Schedule Profile

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| JAUS   | 1.000   | 1.400   | 0.856   | 1.086   | 1.096   | 1.199               | 1.357   |

**A. Mission Description and Budget Item Justification:**

The intent of this program is to develop common open software architecture to ensure unmanned systems' interoperability and evolution with resultant cost savings. JAUS will specify the interfaces between software modules to allow for rapid technology transfer. Continue to develop JAUS such that it attains clear objectives and maintains a consistent philosophy while promoting JAUS as the domain architecture for Unmanned Systems. We will educate the Unmanned Systems community on JAUS to support acquiring, developing, testing, and manufacturing organizations' incorporation of JAUS into their products and services and pursue the adoption of JAUS as a commercial and military standard.

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 1.000   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Released Version 1.0 and Version 1.1 of the JAUS Strategic Plan.
- Drafted Version 1.0 of the JAUS Compliance Specification.
- Drafted Version 3.0 of the JAUS Domain Model.
- Established a JAUS TCP/UDP port number.
- Released Version 1.5 of the JAUS SOP.
- Conducted four JAUS Working Group meetings.

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|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 1.400   | 0.856   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Plans for FY2004-2005 are to demonstrate and validate dynamic registration and expansion port capabilities.
- The compliance suite will be completed.
- Establish JAUS as a commercial standard with the Society of Automotive Engineers.
- Release Version 3.0 of the Domain Model.
- Release Version 1.0 of the Compliance Specification.

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

Not Applicable

**E. Major Performers:**

Not Applicable

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                       |              |                       |              | Date:                 | February 2004 |               |                     |               |                                |  |
|--|------------------------------|--------------------------------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------|---------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE   |                              |                                      | Program Element       |              |                       |              | JAUS                  |               |               |                     |               |                                |  |
| BUDGET ACTIVITY 4  |                              |                                      | PE 0603709D8Z         |              |                       |              |                       |               |               |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>2003<br>Cost | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost          | Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| Primary Hardware Development                                       |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Ancilliary Hardware Development                                    |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Systems Engineering  |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Licenses   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Tooling  |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| GFE  |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Award Fees   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Subtotal Product Development                                       |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Remarks:   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Development Support  |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Software Development   |                              |                                      | 0.650                 | 0.750        |                       | 0.500        |                       |               |               |                     |               |                                |  |
| Training Development   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Integrated Logistics Support                                       |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Configuration Management   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Technical Data   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| GFE  |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |
| Subtotal Support   |                              |                                      | 0.650                 | 0.750        |                       | 0.500        |                       |               |               |                     |               |                                |  |
| Remarks:   |                              |                                      |                       |              |                       |              |                       |               |               |                     |               |                                |  |

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| <b>Exhibit R-3 Cost Analysis (page 2)</b>                          |                              |                                      |                                  |              |                       |              |                       | Date: | February 2004 |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|-------|---------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | JAUS                  |       |               |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>2003<br>Cost            | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost  | Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| DT   |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| IOT&E  |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Initial Verification Testing                                       |                              |                                      |                                  | 0.300        |                       | 0.100        |                       |       |               |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Subtotal T&E   |                              |                                      |                                  | 0.300        |                       | 0.100        |                       |       |               |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Contractor Engineering Support                                     |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Government Engineering Support                                     |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Program Management Support   |                              |                                      | 0.150                            | 0.150        |                       | 0.056        |                       |       |               |                     |               |                                |  |
| Program Management Personnel                                       |                              |                                      | 0.050                            | 0.050        |                       | 0.050        |                       |       |               |                     |               |                                |  |
| Travel   |                              |                                      | 0.050                            | 0.050        |                       | 0.050        |                       |       |               |                     |               |                                |  |
| Labor (Research Personnel)   |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Miscellaneous  |                              |                                      | 0.100                            | 0.100        |                       | 0.100        |                       |       |               |                     |               |                                |  |
| Subtotal Management  |                              |                                      | 0.350                            | 0.350        |                       | 0.256        |                       |       |               |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |
| Total Cost   |                              |                                      | 1.000                            | 1.400        |                       | 0.856        |                       |       |               |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |       |               |                     |               |                                |  |



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| Exhibit R-4a, Schedule Detail                               |  |         |        | Date: February 2004             |                   |        |        |        |
|---|--|---------|--------|---------------------------------|-------------------|--------|--------|--------|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 | Program Element Number and Name<br>PE 0603708DZ Joint Robotics Program |         |        | Project Number and Name<br>JAUS |                   |        |        |        |
| Schedule Profile  | FY 2001  | FY 2002 | FY2003 | FY2004                          | FY2005            | FY2006 | FY2007 | FY2008 |
| RA Versions 3.1; 3.2; 4.0; 4.1                              |  |         |        | 2Q;4Q                           | 1Q; 3Q            |        |        |        |
| DM Versions 3.0; 3.1; 3.2; 3.3; 4.0; 4.1; 4.2; 4.3          |  |         |        | 1Q; 2Q;<br>3Q; 4Q               | 1Q; 2Q;<br>3Q; 4Q |        |        |        |
| Compliance Spec Versions 1.0; 2.0                           |  |         |        | 3Q                              | 1Q                |        |        |        |
| Developmental Evaluation                                    |  |         | Cont.  | Cont.                           | Cont.             |        |        |        |

R-4a Schedule Profile



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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| GLADIATOR  | 3.125   | 1.140   | 1.140   | 1.152   | 1.220   | 1.090               | 1.211   |

**A. Mission Description and Budget Item Justification:**

The Gladiator Program is a USMC initiative based on the Joint Army-Marine Corps Tactical Unmanned Vehicle (TUV) ORD originated by the U.S. Army Infantry School. Mission Need Statement (MNS) INT 12.1.1 (dated 4 November 1993) validated the need for a tactical unmanned ground vehicle system, and the ORD was approved by the Army in August 1995 and by the Marine Corps in May 1996. Changes in Service deficiencies and required capabilities have led both Services to reevaluate the existing ORD and to initiate efforts to revise it or to approve new requirements documents for robotic systems supporting the tactical commander. The Marine Corps has drafted the Gladiator ORD to support the dismounted infantry of the Marine Ground Combat Element (GCE) with the organic unmanned capability to remote combat tasks including scout/surveillance. The system will reduce risk and neutralize threats to Marines across the full spectrum of conflict and military operations. Gladiator formal requirement document is in final staffing within the Marine Corps. The Gladiator is a teleoperated/semi-autonomous, small-to-medium sized, highly mobile UGV with, initially, the basic capability to conduct scout/surveillance missions and to carry various mission payloads for specific tasks. It will be inherently simple, durable, multi-functional, and easily transported. In the conduct of Operational Maneuver From The Sea (OMFTS), Ship To Objective Maneuver (STOM), Sustained Operations Ashore (SOA), and Operations Other Than War (OOTW), the Gladiator will enhance the ability to accomplish assigned missions. Operating just forward of the GCE units, Gladiator will perform basic scouting/surveillance, obstacle breaching, and NBC reconnaissance tasks while permitting the operator to remain covered or concealed. The basic Marine Corps system will consist of a mobile base unit (MBU), an OCU, and specific mission payload modules (MPMs). Initial MPMs will include Joint Chemical Agent

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Detector (JCAD), Anti-Personnel Obstacle Breaching System (APOBS), and direct fire (lethal and non-lethal) weapons.

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**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 3.125   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Complete Technical Development Model (TDM) evaluation and down-select to two contractors.
- Integrate NBC module on Concept Validation Models (CVMs).
- Complete early user evaluation of CVMs.
- Coordinate Gladiator requirements and program plans with the Future Combat System Program.

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|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 1.140   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Complete Detailed Design of Gladiator.
- Complete Future Naval Capability demonstrations.
- Prepare Milestone B documentation.
- Obtain Milestone B approval, initiate System Design and Development (SDD).

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 0.000   | 1.140   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Complete Log Demo.
- Initiate and complete Development Test.
- Begin Operational Test

**C. Other Program Funding Summary:**

Gladiator is a cooperative program of the Office of Naval Research and the DoD Joint Robotics Program. The ONR is responsible for funding the major portion of the technology demonstration, while the JRP continues to manage the Gladiator program through SDD to production in support of Marine Corps requirements. FNC funding, under Autonomous Operations is:

FY 2002 5.000 million  
 FY 2003 2.500 million  
 FY 2004 1.500 million

**D. Acquisition Strategy:**

Two contractors were selected for down select competition for Gladiator SDD. These two contractors are Lockheed Martin, Bethesda, MD and Carnegie Mellon, Pittsburgh, PA.

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**E. Major Performers:**

Not Applicable

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                      |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |
|--|------------------------------|--------------------------------------|----------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|
| DEFENSE-WIDE   |                              |                                      | Program Element      |              |                       |              | GLADIATOR             |               |                       |                     |               |                                |
| BUDGET ACTIVITY 4  |                              |                                      | PE 0603709D8Z        |              |                       |              |                       |               |                       |                     |               |                                |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |
| Primary Hardware Development                                       |                              |                                      |                      | 2.335        |                       | 1.373        |                       | 0.373         |                       |                     |               |                                |
| Ancilliary Hardware Development                                    |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Systems Engineering  |                              |                                      |                      | 0.148        |                       | 0.095        |                       | 0.095         |                       |                     |               |                                |
| Licenses   |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Tooling  |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| GFE  |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Award Fees   |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Subtotal Product Development                                       |                              |                                      |                      | 2.483        |                       | 1.468        |                       | 0.468         |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Development Support  |                              |                                      |                      | 0.040        |                       | 0.172        |                       | 0.172         |                       |                     |               |                                |
| Software Development   |                              |                                      |                      | 0.075        |                       |              |                       |               |                       |                     |               |                                |
| Training Development   |                              |                                      |                      | 0.050        |                       | 0.095        |                       | 0.095         |                       |                     |               |                                |
| Integrated Logistics Support                                       |                              |                                      |                      | 0.025        |                       |              |                       |               |                       |                     |               |                                |
| Configuration Management   |                              |                                      |                      | 0.055        |                       |              |                       |               |                       |                     |               |                                |
| Technical Data   |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| GFE  |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |
| Subtotal Support   |                              |                                      |                      | 0.245        |                       | 0.267        |                       | 0.267         |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |               |                       |                     |               |                                |

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R-1 Shopping List Item No.59  
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| Exhibit R-3 Cost Analysis (page 2)                           |                        |                                |                |                               |                 |           | Date: February 2004 |           |                 |                  |            |                          |
|--|------------------------|--------------------------------|----------------|-------------------------------|-----------------|-----------|---------------------|-----------|-----------------|------------------|------------|--------------------------|
| DEFENSE-WIDE BUDGET ACTIVITY 4                               |                        |                                |                | Program Element PE 0603709D8Z |                 |           | GLADIATOR           |           |                 |                  |            |                          |
| Cost Categories (Tailor to WBS, or System/Item Requirements) | Contract Method & Type | Performing Activity & Location | Total PYs Cost | 2003 Cost                     | 2003 Award Date | 2004 Cost | 2004 Award Date     | 2005 Cost | 2005 Award Date | Cost To Complete | Total Cost | Target Value of Contract |
| DT   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| IOT&E  |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Initial Verification Testing                                 |                        |                                |                | 0.130                         |                 | 0.135     |                     | 0.135     |                 |                  |            |                          |
|  |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
|  |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Subtotal T&E   |                        |                                |                | 0.130                         |                 | 0.135     |                     | 0.135     |                 |                  |            |                          |
| Remarks:   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Contractor Engineering Support                               |                        |                                |                | 0.067                         |                 | 0.070     |                     | 0.070     |                 |                  |            |                          |
| Government Engineering Support                               |                        |                                |                | 0.120                         |                 | 0.120     |                     | 0.120     |                 |                  |            |                          |
| Program Management Support                                   |                        |                                |                | 0.080                         |                 | 0.080     |                     | 0.080     |                 |                  |            |                          |
| Program Management Personnel                                 |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Travel   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Labor (Research Personnel)                                   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Miscellaneous  |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Subtotal Management  |                        |                                |                | 0.267                         |                 | 0.270     |                     | 0.270     |                 |                  |            |                          |
| Remarks:   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |
| Total Cost   |                        |                                |                | 3.125                         |                 | 1.140     |                     | 1.140     |                 |                  |            |                          |
| Remarks:   |                        |                                |                |                               |                 |           |                     |           |                 |                  |            |                          |

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| Exhibit R-4, Schedule Profile                               |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   | Date: February 2004                  |      |   |   |   |      |   |   |   |      |   |   |   |
|---|--|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|--------------------------------------|------|---|---|---|------|---|---|---|------|---|---|---|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #5 |  |   |   |   |      |   |   |   |      |   |   | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |      |   |   |   |      |   |   |   |      |   |   | Project Number and Name<br>GLADIATOR |      |   |   |   |      |   |   |   |      |   |   |   |
| Fiscal Year   | 2001   |   |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |   | 2006 |   |   |                                      | 2007 |   |   |   | 2008 |   |   |   | 2009 |   |   |   |
|   | 1  | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4                                    | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |
| Acquisition Milestones                                      | [Timeline bar with markers: MS B (triangle) at 2004 Q3, MS C (triangle) at 2006 Q1, FUE (star) at 2007 Q4] |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| Prototype Phase   | [Timeline bar]   |   |   |   |      |   |   |   |      |   |   |   | MS B |   |   |   |      |   |   |   | MS C |   |   |                                      |      |   |   |   | FUE  |   |   |   |      |   |   |   |
| Program Milestones  |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| Log Demo  |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| T&E Milestones  |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| Independent Verification Test                               |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| DT  |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| OT  |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| IOT&E   |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| Production Milestones                                       |  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| LRIP FY 06  | LRIP start [Timeline bar with triangle marker at 2006 Q1]  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| FRP FY 07   | FRP start [Timeline bar with triangle marker at 2007 Q4]   |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |
| Deliveries  | [Timeline bar with boxes: 44 (2007 Q3), 44 (2008 Q3), 47 (2009 Q3)]  |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                      |      |   |   |   |      |   |   |   |      |   |   |   |

R-4 Schedule Profile

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| Exhibit R-4a, Schedule Detail  |         |   |        | Date: February 2004 |                                      |        |        |        |
|--|---------|---|--------|---------------------|--------------------------------------|--------|--------|--------|
| Appropriation/Budget Activity<br>Research, Development, Test &<br>Evaluation, Defense-Wide, Budget<br>Activity 4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>Gladiator |        |        |        |
| Schedule Profile   | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005                               | FY2006 | FY2007 | FY2008 |
| Milestone A  |         |   |        |                     |                                      |        |        |        |
| Contract Preparation   |         | 1-2Q  |        |                     |                                      |        |        |        |
| CTD Contract Award   |         | 2Q  |        |                     |                                      |        |        |        |
| CTD  |         | 2-4Q  | 1-4Q   |                     |                                      |        |        |        |
| Milestone B  |         |   |        | 3Q                  |                                      |        |        |        |
| Contract Preparation   |         |   |        | 2-4Q                |                                      |        |        |        |
| SDD Contract Award   |         |   |        | 4Q                  |                                      |        |        |        |
| SDD  |         |   |        | 3-4Q                | 1-4Q                                 |        |        |        |
| Developmental Test   |         |   |        |                     | 3-4Q                                 |        |        |        |
| Log Demo   |         |   |        |                     | 4Q                                   |        |        |        |
| Operational Test   |         |   |        |                     | 4Q                                   | 1Q     |        |        |
| Milestone C  |         |   |        |                     |                                      | 2Q     |        |        |
| Low Rate Initial Production  |         |   |        |                     |                                      | 2Q     |        |        |
| IOT&E  |         |   |        |                     |                                      |        | 2Q     |        |
| Full Rate Production   |         |   |        |                     |                                      |        | 4Q     |        |
| First Unit Equipped  |         |   |        |                     |                                      |        | 4Q     |        |

R-4a Schedule Profile

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM NOMENCLATURE<br>JOINT ROBOTICS PROGRAM PE 0603709D8Z |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| RCSS   | 2.318   | 1.058   | 1.060   | 1.100   | 1.120   | 1.094               | 1.120   |

**A. Mission Description and Budget Item Justification:**

The Robotic Combat Support System (RCSS) Program is an upgrade approach from the Product Improved Mini-Flail (PIMF). The PIMF has proven effective in Bosnia and Kosovo, as well as in current operation in Afghanistan, as a contingency asset. RCSS threshold requirements include anti-personnel mine clearing and neutralization, improved reliability and human-machine interface, Anti-Personnel wire obstacle breaching, remotely deployed smoke and obscurants, and the capability to carry soldier loads. P3I requirements include advanced controls, remotely delivered special munitions to support dismounted operations, hands-free control using dismounted soldier leader-follower technology, and mechanical devices that will be used to emplace demolitions and special breaching systems. The RCSS Mission Need Statement (MNS) and Operational Requirements Document (ORD) have been approved by Army Training and Doctrine Command (TRADOC).

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 2.318   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Completed evaluation of CTD contract efforts.
- Revised Acquisition Strategy to meet War on Terrorism Urgent Requirements.
- Conducted market survey to determine availability of COTS capability.

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 1.055   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Select RCSS COTS vendor.
- Initiate RCSS COTS procurement contract.

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- Determine and identify Mission Essential Modules to improve COTS system multi-mission capability.
- Initiate Mission Essential Modules Integration program.

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 0.000   | 1.065   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Continue Mission Essential Module Integration program.

**C. Other Program Funding Summary:**

Army Procurement funding utilized to procure RCSS COTS systems in FY 04.

**D. Acquisition Strategy:**

Not Applicable

**E. Major Performers:**

Not Applicable

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                                  |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | RCSS                  |               |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| Primary Hardware Development                                       |                              |                                      |                                  | 1.230        |                       | 0.284        |                       | 0.284         |                       |                     |               |                                |  |
| Ancilliary Hardware Development                                    |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Systems Engineering  |                              |                                      |                                  | 0.446        |                       | 0.142        |                       | 0.142         |                       |                     |               |                                |  |
| Licenses   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Tooling  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Award Fees   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Product Development                                       |                              |                                      |                                  | 1.676        |                       | 0.426        |                       | 0.426         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Development Support  |                              |                                      |                                  | 0.040        |                       | 0.002        |                       | 0.002         |                       |                     |               |                                |  |
| Software Development   |                              |                                      |                                  | 0.075        |                       | 0.062        |                       | 0.062         |                       |                     |               |                                |  |
| Training Development   |                              |                                      |                                  | 0.050        |                       | 0.030        |                       | 0.030         |                       |                     |               |                                |  |
| Integrated Logistics Support                                       |                              |                                      |                                  | 0.025        |                       | 0.025        |                       | 0.025         |                       |                     |               |                                |  |
| Configuration Management   |                              |                                      |                                  | 0.055        |                       | 0.025        |                       | 0.025         |                       |                     |               |                                |  |
| Technical Data   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Support   |                              |                                      |                                  | 0.245        |                       | 0.144        |                       | 0.144         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |

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| Exhibit R-3 Cost Analysis (page 2)                                 |                              |                                      |                                  |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | RCSS                  |               |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| DT   |                              |                                      |                                  |              |                       | 0.288        |                       | 0.288         |                       |                     |               |                                |  |
| IOT&E  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Initial Verification Testing                                       |                              |                                      |                                  | 0.130        |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal T&E   |                              |                                      |                                  | 0.130        |                       | 0.288        |                       | 0.288         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Contractor Engineering Support                                     |                              |                                      |                                  | 0.067        |                       | 0.063        |                       | 0.065         |                       |                     |               |                                |  |
| Government Engineering Support                                     |                              |                                      |                                  | 0.120        |                       | 0.074        |                       | 0.074         |                       |                     |               |                                |  |
| Program Management Support   |                              |                                      |                                  | 0.080        |                       | 0.063        |                       | 0.065         |                       |                     |               |                                |  |
| Program Management Personnel                                       |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Travel   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Labor (Research Personnel)   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Miscellaneous  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Management  |                              |                                      |                                  | 0.267        |                       | 0.200        |                       | 0.202         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Total Cost   |                              |                                      |                                  | 2.318        |                       | 1.058        |                       | 1.060         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |

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| Exhibit R-4, Schedule Profile                               |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   | Date: February 2004             |      |   |   |   |      |  |  |  |
|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---------------------------------|------|---|---|---|------|--|--|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |      |   |   |   |      |   |   |   |      |   |   |   |      | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |   |   |      |   |   |   |      |   |   |   |      |   |   | Project Number and Name<br>RCSS |      |   |   |   |      |  |  |  |
| Fiscal Year   | 2001 |   |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |   | 2006 |   |   |   | 2007 |   |   |                                 | 2008 |   |   |   | 2009 |  |  |  |
|   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2   | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4                               | 1    | 2 | 3 | 4 |      |  |  |  |
| Acquisition Milestones                                      |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| Log Demo  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| Maintenance/Log Demo  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| T&E Milestones  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| Independent Verification Test                               |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| DT  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| IOT&E   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| Production Milestones                                       |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| FRP FY 06   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |
| Deliveries  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |      |  |  |  |

R-4 Schedule Profile

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| Exhibit R-4a, Schedule Detail  |         |   |        | Date: February 2004   |        |        |        |        |  |
|--|---------|---|--------|---|--------|--------|--------|--------|--|
| Appropriation/Budget Activity<br>Research, Development, Test &<br>Evaluation, Defense-Wide, Budget<br>Activity 4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        | Project Number and Name<br>Robotic Combat Support System (RCSS) |        |        |        |        |  |
| Schedule Profile   | FY 2001 | FY 2002   | FY2003 | FY2004  | FY2005 | FY2006 | FY2007 | FY2008 |  |
| Milestone A  | 1Q      |   |        |   |        |        |        |        |  |
| Contract Preparation   | 1-4Q    | 1-4Q  | 1-4Q   |   |        |        |        |        |  |
| CTD Contract Award   | 4Q      |   | 1Q     |   |        |        |        |        |  |
| CTD  | 4Q      | 1-4Q  | 1Q     |   |        |        |        |        |  |
| Milestone B  |         |   | 1Q     |   |        |        |        |        |  |
| Contract Preparation   |         | 4Q  | 1Q     |   |        |        |        |        |  |
| SDD Contract Award   |         |   | 1Q     |   |        |        |        |        |  |
| SDD  |         |   | 1-4Q   |   |        |        |        |        |  |
| Developmental Test   |         |   |        | 1-2Q  |        |        |        |        |  |
| Maintenance/Log Demo   |         |   |        | 2Q  |        |        |        |        |  |
| IOT&E  |         |   |        | 3-4Q  |        |        |        |        |  |
| Milestone C  |         |   |        |   | 1Q     |        |        |        |  |
| Full Rate Production   |         |   |        |   | 2Q     |        |        |        |  |
| First Unit Equipped  |         |   |        |   | 3Q     |        |        |        |  |

R-4a Schedule Profile

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM NOMENCLATURE<br>JOINT ROBOTICS PROGRAM PE 0603709D8Z |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| NUSE 2   | 0.000   | 2.100   | 1.065   | 1.100   | 1.123   | 1.090               | 1.120   |

**A. Mission Description and Budget Item Justification:**

The National Unmanned Systems Experimentation Environment (NUSE2) is a new Department of Defense/Private sector teaming initiative. This will be a collaborative effort to provide infrastructure and assets for experimenting with all types of Unmanned Systems - air, ground, surface and underwater - that is national in scope. NUSE2 will provide developers/acquirers of Unmanned Systems with dedicated experimentation facilities, ranges, and airspace that would otherwise be hard to schedule and are often expensive. The initiative will begin in FY 2004, starting with some limited objective experiments using Unmanned Ground Vehicles.

NUSE2 will be a consortium of organizations agreeing to form and provide the experimentation capability. The Nation is the true beneficiary of this effort and conveys the coast-to-coast and Alaska and Hawaii, scope of NUSE2. NUSE2 is intended to provide an experimentation base for Unmanned System acquirers over the life cycle. This will include live as well as virtual experiments. NUSE2 will be a valuable asset in the coming years, providing accessible, affordable, RDTE capabilities.

The objectives of NUSE2 are to:

- Assist users in refining capabilities (formerly operational requirements)
- Support acquirers in conducting experiments to reduce technical risk.
- Participate in the evaluation of evolutionary upgrades to Unmanned Systems
- Support experiments associated with Advanced Concept Technology Demonstrations
- Facilitate the evaluation of new technologies and aid the tech transfer process of new capabilities for Unmanned Systems
- Support the developmental, operational, and live fire testing requirements of acquirers
- Aid in the development of advanced integrated architectures as they apply to Unmanned Systems

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- Be dual capable, i.e., able to support experimentation and testing in both live and virtual venues

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 2.100   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Initiate NUSE2 concept and develop strategy, campaign plan, and organize team.
- Conduct Site Surveys.
- Organize and stand up Integrated Product Teams (IPTs).
- Organize and stand up the Management IPT.
- Identify and refine standards and metrics for experiments.
- Identify and acquire infrastructure requirements.
- Conduct initial live and virtual experiments (countermine).
- Identify and begin planning for follow-on experimentation.

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 0.000   | 1.065   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Continue to identify and acquire infrastructure requirements.
- Continue IPT oversight.
- Continue to identify and refine standards and metrics for experiments.
- Conduct live and virtual experimentation.
- Expand NUSE2 as required.
- Expand NUSE2 capabilities to include unmanned air, surface, and subsurface systems.

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

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Not Applicable

**E. Major Performers:**

Not Applicable

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                                  |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | NUSE 2                |               |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| Primary Hardware Development                                       |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Ancillary Hardware Development                                     |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Systems Engineering  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Licenses   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Tooling  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Award Fees   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Product Development                                       |                              |                                      |                                  |              |                       | 0.000        |                       | 0.000         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Development Support  |                              |                                      |                                  |              |                       | 0.500        |                       |               |                       |                     |               |                                |  |
| Software Development   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Training Development   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Integrated Logistics Support                                       |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Configuration Management   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Technical Data   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Support   |                              |                                      |                                  |              |                       | 0.500        |                       | 0.250         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |

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| Exhibit R-4, Schedule Profile                               |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   | Date: February 2004               |      |   |   |   |      |   |   |   |      |   |   |   |
|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|-----------------------------------|------|---|---|---|------|---|---|---|------|---|---|---|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |      |   |   |   |      |   |   |   |      |   |   | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |      |   |   |   |      |   |   |   |      |   |   | Project Number and Name<br>NUSE 2 |      |   |   |   |      |   |   |   |      |   |   |   |
| Fiscal Year   | 2001 |   |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |   | 2006 |   |   |                                   | 2007 |   |   |   | 2008 |   |   |   | 2009 |   |   |   |
|   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4                                 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |
| Infrastructure  |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                   |      |   |   |   |      |   |   |   |      |   |   |   |
| Standards Identification                                    |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                   |      |   |   |   |      |   |   |   |      |   |   |   |
| UMS Experiments   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                   |      |   |   |   |      |   |   |   |      |   |   |   |

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| Exhibit R-4a, Schedule Detail  |         |   |        | Date: February 2004 |                                   |        |        |        |
|--|---------|---|--------|---------------------|-----------------------------------|--------|--------|--------|
| Appropriation/Budget Activity<br>Research, Development, Test &<br>Evaluation, Defense-Wide, Budget<br>Activity 4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>NUSE 2 |        |        |        |
| Schedule Profile   | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005                            | FY2006 | FY2007 | FY2008 |
| Infrastructure   |         |   |        | 3-4Q                | 1-4Q                              |        |        |        |
| Standards Identification   |         |   |        | 3-4Q                | 1-4Q                              |        |        |        |
| UMS Experiments  |         |   |        | 3Q                  | 2Q, 4Q                            |        |        |        |

R-4a Schedule Profile

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| Intelligent Mobility Program                             | 1.200   | 1.000   | 1.120   | 1.139   | 1.420   | 1.261               | 1.230   |

**A. Mission Description and Budget Item Justification:**

The Intelligent Mobility program is an effort under the U.S. Army Research and Development Command Engineering Center (RDECOM-TARDEC) Intelligent Mobility (IM) Program. Mobility Enhancement through the utilization of novel running gear such as reconfigurable shape, Omni-directional drive systems, and improved mobility sensor integration will improve the mobility of small unmanned ground vehicles (UGVs) to operate on both improved surfaces and off-road terrain in support of urban warfare, physical security and force protection missions for military police and engineering operations. Of particular and immediate interest is the Omni-Directional Inspection System (ODIS) developed through a partnership between the TARDEC robotics mobility lab (TRML) and Utah State University's Center for Self-Organizing and Intelligent Systems (CSOIS), which is a man packable size robot capable of omni-directional locomotion on structured surfaces for the purpose of inspecting vehicles in a force protection role and in an EOD role as an IED disruptor delivery device. There is a current "validated urgent need generated by CENTCOM to utilize UGV's for EOD and force protection missions. Prototype ODIS UGV's are currently in the process of deployment to Iraq and Afghanistan in order to collect data, prove out the current prototype system, and simultaneously provide needed UGV functionality to the user in hostile environments. TRML is also working to develop a draft Mission Needs Statement for the ODIS robot with Military Police/Force Protection agencies.

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 1.200   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

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- Completed successful mission testing at Port of Los Angeles / Port of Long Beach with US Coast Guard and other agencies.
- Supported the Dept. of Justice in a Homeland Defense Force Protection mission during the Lee Malvo Sniper trial
- Extended Other Transaction for follow on ODIS work with Utah State University
- Completed revision and product improvement of ODIS for functional prototype testing.
- Completed build of 10 ODIS systems for extended testing (OCU's are pending 2Q FY 2004)
- Awarded Work Directive for cold regions mechanical testing and RF analysis of small robotic platforms.

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 1.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 0.000   | 1.120   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

FY04 and FY05 expected Accomplishments

- Planned completion of additional 10 ODIS systems for deployment to Iraq, and extended testing (2Q FY 2004)
- Investigate utility and need for ODIS platform variants.
- Improve robot control based on Iraq deployment data
- Improve methods for integrating mission packages
- Investigate other intelligent mobility mechanical concepts for improved functionality

**C. Other Program Funding Summary:**

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\$.800 million awarded to Utah State University using JRP funding previously allocated to US Navy SPAWAR for prototype build of ODIS.

**D. Acquisition Strategy:**

Not Applicable

**E. Major Performers:**

Kachemak Research Development Center      \$1,995K  
Contractor  
Homer, Alaska

Utah State University      \$300K  
University  
Logan, Utah

Utah State University      \$800K (reprogrammed funds from US Navy SPAWAR)  
University  
Logan, Utah

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                      |              |                       |              | Date: February 2004   |              |                       |                     |               |                                |
|--|------------------------------|--------------------------------------|----------------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------------|---------------|--------------------------------|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              | Program Element<br>PE 0603709D8Z     |                      |              |                       |              | Intelligent Mobility  |              |                       |                     |               |                                |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |
| Primary Hardware Development                                       |                              |                                      |                      | 0.220        |                       | 0.223        |                       | 0.147        |                       |                     |               |                                |
| Ancilliary Hardware Development                                    |                              |                                      |                      | 0.047        |                       | 0.063        |                       | 0.049        |                       |                     |               |                                |
| Systems Engineering  |                              |                                      |                      | 0.070        |                       | 0.063        |                       | 0.033        |                       |                     |               |                                |
| Licenses   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Tooling  |                              |                                      |                      |              |                       |              |                       | 0.033        |                       |                     |               |                                |
| GFE  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Award Fees   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal Product Development                                       |                              |                                      |                      | 0.337        |                       | 0.349        |                       | 0.262        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Development Support  |                              |                                      |                      | 0.140        |                       | 0.063        |                       | 0.065        |                       |                     |               |                                |
| Software Development   |                              |                                      |                      | 0.187        |                       | 0.089        |                       | 0.022        |                       |                     |               |                                |
| Training Development   |                              |                                      |                      | 0.047        |                       | 0.062        |                       | 0.033        |                       |                     |               |                                |
| Integrated Logistics Support                                       |                              |                                      |                      | 0.033        |                       | 0.032        |                       | 0.033        |                       |                     |               |                                |
| Configuration Management   |                              |                                      |                      | 0.033        |                       | 0.032        |                       | 0.065        |                       |                     |               |                                |
| Technical Data   |                              |                                      |                      |              |                       | 0.032        |                       | 0.131        |                       |                     |               |                                |
| GFE  |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal Support   |                              |                                      |                      | 0.440        |                       | 0.310        |                       | 0.349        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                      |              |                       |              |                       |              |                       |                     |               |                                |

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| Exhibit R-4a, Schedule Detail  |         |  |        | Date: February 2004                             |        |        |        |        |
|--|---------|--|--------|---|--------|--------|--------|--------|
| Appropriation/Budget Activity<br>RDT&E, Defense Wide, Budget<br>Activity 4 |         | Program Element Number and Name<br>PE 0603709D8Z |        | Project Number and Name<br>Intelligent Mobility |        |        |        |        |
| Schedule Profile   | FY 2001 | FY 2002  | FY2003 | FY2004  | FY2005 | FY2006 | FY2007 | FY2008 |
| Contract Preparation   | 1Q      | 2Q   | 1Q     | 1Q  | 1Q     | 1Q     | 1Q     |        |
| System Development   | 2-4Q    | 3-4Q   | 2-4Q   | 3Q  | 4Q     | 3Q     | 3Q     |        |
| Quality Design and Build   | 4Q      | 1Q   | 4Q     | 4Q  | 3Q     | 4Q     | 4Q     |        |
| Developmental (PD&RR) Technical Testing                                    |         | 4Q   | 1Q     |   | 2Q     |        | 4Q     |        |
| Developmental Evaluation   |         |  | 1Q     |   | 3Q     |        | 4Q     |        |
| Etc.   |         |  |        |   |        |        |        |        |

R-4a Schedule Profile

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   |         | Date: February 2004 |         |
|--|---------|---------|---------|---|---------|---------------------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |         |                     |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007 | FY 2008             | FY 2009 |
| RACS   | 5.200   | 4.500   | 5.520   | 5.310   | 5.326   | 5.280               | 5.290   |

**A. Mission Description and Budget Item Justification:**

The Robotics for Agile Combat Support (RACS) is a USAF effort to advance the robotic state-of-the-art capability for counter-terrorism and force protection technologies. RACS programs include the following: Advancements for the All-purpose Remote Transport System (ARTS), Advanced Systems and Control, Active Range Clearance, Force Protection Robotics, and the Next Generation Explosive Ordnance Disposal Remote Control Vehicle (NGEODRCV). The basic platform for the ARTS has been formally transitioned to a Systems Program Office (SPO) for production and sustainment. Future improvements and advancements will enhance the control and payload capabilities for this system. This technology has been applied to Formerly Used Defense Sites (FUDS) and active range clearance for cleanup/disposal.

**B. Accomplishments/Planned Program**

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 5.200   | 4.500   | 5.520   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Airborne Engineer - This research effort develop a prototype concept demonstrator that will provide small area ordnance clearance system to allow rapid beddown of RED HORSE personnel. The system includes Power Rake, GPS, New Laptop Operator Control Station, Clam Shell Bucket, and AR-10, 7.62 mm rifle for Stand off Munitions Disruption. The Chief of Staff (CSAF), United States Air Force (USAF) stated that the Air Force requires an Airborne Rapid Engineer Deployable Heavy Operations Repair Squadron, Engineers (RED HORSE) combat engineer capability to "Assess, Prepare and Establish" contingency airbases in remote locations through airdrop, air-insertion, or air-delivery. This requires training some existing RED HORSE personnel as jump-capable and acquiring lighter equipment that is air-droppable, air-insertable, or air-deliverable.

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It also requires in some cases for Airborne RED HORSE to be augmented by Explosive Ordnance Disposal (EOD), Readiness, and Fire Rescue to meet mission requirements. This Airborne RED HORSE Engineer Concept of Operations (CONOPS) supports the Global Strike Task Force CONOPS: once F-22 and B-2 stealth roll back the enemy offensive threat and uncover basing structure, follow-on forces in the way of Airborne RED HORSE Engineers can deploy to an air base and fix damaged runways for continued offensive operations. Accomplishments include development and transition of three prototypes of the Airborne Engineer ARTS that were airdrop certified (two of which were deployed to Operation Iraqi Freedom).

- Power Rake - This effort is sponsored in cooperation with HQ ACC/CEX for the Air Force Airborne Engineer initiative. The Power Rake is a military munitions clearance tool developed for use on the ARTS robot. The Power Rake will remove or detonate sub-munitions and anti-personnel mines for the purpose of small area-clearance, lane proofing, and active range clearance. The research goals for this effort are:
  1. Investigate the available COTS equipment that is capable of performing this task.
  2. Develop and integrate a lightweight armor package for the Power Rake attachment.
  3. Characterize the system performance including: explosives resistance, operational capabilities, and system reliability. This effort will provide two proof-of-concept systems for testing and evaluation.
- Enhanced Standoff Munitions Disruption System (E-SMUD) - Sponsored in cooperation with the Office of Special Technology EOD Low Intensity Conflict Office, this effort is for EOD personnel of the Air Force and Marines. This research effort consists of integrating a Telepresent Rapid Aiming Platform (TRAP) from Precision Remotes to the ARTS platform to provide EOD personnel the remote capability of detonating, disrupting, or deflagrating small ordnance at safe distances, thereby taking the EOD technician out of harms way. This effort will provide two prototype systems, one for the USMC that incorporates the Barrett .50 caliber and 7.62 mm Designated Marksmanship Rifle (DMR) and another to the USAF with the Barrett .50 caliber and 5.56 mm rifles. These systems provide remote capability to bring to bear 7.62mm or 0.50 caliber rifle against surface scatterable munitions. Integrating visual optics and current pan/tilt technology, this technology removes the EOD technician out-of-harms way to perform clearance of high threat submunitions currently being validated on CONUS ranges while practice for wartime clearance procedures. A low cost laboratory demonstrator version of a AR-10, 7.62mm rifle has been developed and limited testing performed. Transition planned late FY03. Tele-operated Remote Aiming Platform: TRAP is a future P<sup>3</sup>I effort that is contained in the CE Readiness Modernization Roadmap and is scheduled to undergo system

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design and development (SDD) in FY 2004 with production to follow in FY2005. Accomplishments include demonstration of a radio controlled TRAP system.

- Robo-Trencher - US Air Force 738 EIS Initiative to provide a standoff capability to perform cable trenching and excavation in hazardous areas. The system need was prompted by 2 separate UXO incidents with manned equipment. Accomplishments included design, build, testing, and delivery of the Robo-Trencher in 90 Days. The integration of production ARTS robotic components to an existing 738<sup>th</sup> EIS Ditch Witch 7610 Trenching Tractor demonstrated the feasibility of using ARTS robotics system as a robotic kit. The system is currently deployed to support Operation Enduring Freedom. User is requesting conversion of three more systems including potential spiral development for increased capabilities.
- Automated Ordnance Excavator (AOE) - This research effort is to develop technologies that can be integrated into an autonomous excavator. To accomplish this goal, technologies must be developed that address the essential mission elements. The development path for this technology is a four-step process: 1. automated digging, 2. independent boom/stick motion, 3. independent machine mobility, and 4. independent work planning and analysis. A contract has been awarded to Caterpillar, Inc. to develop the 1<sup>st</sup> stage technology, an Auto-dig Mission Planning Module (AMPM) for the AOE. The AMPM is a JAUS compatible electronics module that will take telemetry data from the AOE, process the data to calculate the boom, stick, and bucket motion paths, and return the motion commands to the AOE for execution. Future efforts will concentrate on the completion of stage 2-4 technologies. Accomplishments for this effort include approximately 75% completion of the auto dig mission planning module and hardware upgrade of the AOE.
- J-LONS (Joint Laser Ordnance Neutralization System) - This effort is to develop and validate a remotely operated modular laser system for standoff UXO/IED neutralization capability. Laser technology has been identified as a viable method of clearing areas clear of UXO by rapidly heating the explosive filler to point of detonation. It may also prove to be a method to gain access and disposal to IEDs. Accomplishments include oversight on the international program partner's development of a low power laser system. Commencing in FY 2004, plans are to begin integration of J-LONS onto a mobile unmanned platform.
- Advanced Robotics System - The primary effort is to develop common architecture designs for autonomous vehicle technologies that focus on vehicle mobility, speed, and control, as well as multi-vehicle operations and marsupial control. This program seeks to develop and document these modular designs within the evolving JAUS Standards. Specifically the program addresses: (1) vehicle position; (2) sensors; (3) path

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planning; (4) path execution; (5) vehicle control, and (6) obstacle detection and avoidance. Multi-vehicle and marsupial control technologies will be developed. Technologies being investigated are position/mapping (GPS/INS, Dual antenna GPS, dead-reckoning), Advanced Operator Control Unit (laptop/PDA), obstacle detection and avoidance, mobile communications (droppable repeaters) and support for the OSD Joint Architecture for Unmanned Systems (JAUS).

- Accomplishments include support to the JAUS community, obstacle detection and avoidance simulation, sensor fusion for obstacle detection, and high speed assisted tele-operation algorithm development. Demonstrated JAUS concepts by controlling multiple robotic systems using a single operator control station.
- REDCAR (Remote Detection Challenge and Response system) - REDCAR is an Air Force, Force Protection Battlelab (AFFB) Initiative to demonstrate the benefits of unmanned systems for the security force mission. The program focuses on the application of mobile unmanned ground systems to support and augment security force personnel in the perimeter defense of Air Force installations and forward deployed units. The AFRL REDCAR system will consist of a network of robotic platforms integrated with existing security force sensors and Tactical, Area Security System (TASS). The REDCAR system will have limited simulation and modeling capabilities to interact with the current AFFPB modeling systems. All components and platforms in the REDCAR system will be capable of communication using JAUS (Joint Architecture for Unmanned Systems) for system interoperability and control. Proof of concepts demonstrations will be conducted in June FY04. Accomplishments development and demonstration of the Scout robotic platform at the Force Protection Battlelab exposition for AF/XOF. Contracts were let for procurement of the MDARS-E and Packbot systems.
- Defense Threat Reduction Agency (DTRA) - DTRA's Integrated Technology Demonstration puts to use Department of Defense (DoD) technology and Federal Emergency Management Agency (FEMA) training exercises to provide possible real-world terrorist scenarios. Accomplishment was the CHER-CAP Exercise, which was performed in February 2003 in Northwest Florida. With the close location of many area DoD laboratories and their missions within the DoD, existing priorities and funding were leveraged with the FEMA exercise scenario. The DTRA Combating Terrorism Program will benefit greatly from this opportunity as it will be able to test DoD technologies that are relevant to a variety of threats to DoD forces and assets in the US and abroad. Participating agencies and organizations included: (1) Defense Threat Reduction Agency Technology Directorate (DTRA/TD); (2) Air Force Research Laboratory Airbase Technologies Division (AFRL/MLQ); (3) Naval Coastal Systems Station (CSS); (4) Air Force Civil Engineer Support Agency (AFCESA); (5) Florida State University Panama City (FSU-PC); (6) Local Emergency

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Planning Committee, Florida District 1 (LEPC); and (7) Federal Emergency Management Agency (FEMA). Northwest Florida's Comprehensive HAZMAT Emergency Response Capability Assessment Program (CHER-CAP Exercise), demonstrated and integrated the following technologies: (1) Port Occurrence Response Training System (PORTS) for exercise planning and documentation tools; (2) Networked Sensor/C2 System for a deployable sensor network; (3) Common Command and Control for Unmanned Systems for unmanned vehicle/platform utilization; and (4) Underwater Forensic Protocol for Forensic and investigation procedure development.

- STORK - The STORK Initiative was a program developed to (1) outfit an Unmanned Aerial Vehicle (UAV) with a communications suite needed to remotely control an Unmanned Ground Vehicle (UGV) and its sensors beyond current system ranges of UGV Ground Control Station; (2) to prove a UAV can deliver a UGV into an area needed during urban operations; and (3) to show UAV/UGV integration can provide persistent target information for Intelligence Preparation of the Battlespace. The STORK Initiative included the following robotic platforms: an ARTS UGV, a Matilda UGV and EEL UGV's, and a Sentry HP UAV. Accomplishments include successful demonstration of the STORK Initiative in March 2003. All objectives were met including extension of UGV control from 2 km out to 26 km, successful insertion of UGV by parachute from the UAV, and simultaneous control of multiple UGV in the area of operations.
- UAV-UGV - This program includes: (1) the development of a dual JAUS / NATO STANAGS-compliant UAV to evaluate JAUS viability in the UAV realm, (2) insertion of Aerial Imagery into OCU for map/model building and situational awareness, aerial Communications Relay to extend the radio range of UGVs, (3) precision UGV marsupial emplacement and recovery using a rotary-wing UAV, and (4) an unmanned helicopter to provide aerial pesticide spraying to mitigate vector-borne disease in deployed operations. Accomplishments included the procurement of the rotary-wing UAV and necessary training and transfer of aerial video through JAUS networked system.
- Active Range Clearance - The US Army Engineering and Support Center (USAESCH) in Huntsville, Alabama requested the AFRL/MLQF Robotics Group to perform a technology demonstration project for an ongoing clearance operation at the Honey Lake site on Sierra Army Depot, CA. Approximately 2500 acres of Honey Lake were contaminated with military munitions scrap and unexploded ordnance from open pit demolition operations. Accomplishments: AFRL/MLQF Robotics Group used existing robotic equipment and tools to assist in the surface clearance operation at Honey Lake from July through September 2003. AFRL/MLQF used the ARTS robotic system with a Barber Surf Rake to remove the majority of scrap items from the lakebed surface. AFRL/MLQF robotics evaluated several innovative concepts during this demonstration including: Night Operations, Simultaneous

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Robotic Operations, and Extended Operations. Robotic night operations were conducted during 6 of the 8 weeks to allow UXO contractor personnel to operate on the site during daylight hours. Multiple systems were simultaneously operated during 2 weeks of the demonstration. In addition, the robotic systems demonstrated the ability to operate in an austere environment for an extended period of time. Over 250 robotic operating hours were accumulated during the technology demonstration. AFRL/MLQF also evaluated a Harley Rock Picker system and towed magnet systems for effectiveness in munitions scrap removal. AFRL's robotic systems removed an estimated 95,600lbs of scrap materials from 19-grids (285 acres) during eight weeks of operations. The site was being cleared using only manual methods by teams of UXO technicians that would walk each grid and pick up all scrap materials larger than a "bottlecap". The robotic system decreased the average time for manual clearance of each grid from 3 weeks to 1 week.

- BomBot - This FY 2004/2005 program investigates low-cost remotely controlled vehicle to deliver an explosive charge to neutralize an Improvised Explosive Device (IED). This will enable a convoy to expediently destroy IEDs remotely through utilization of two alternatives: Non-Recoverable, Recoverable: Non-Recoverable model will be destroyed with the charge and the recoverable model will drop off charge, and then be driven back to the control point. Vehicle is operated using line-of-sight communications.

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

Technology transition plans (TTPs) are developed when concept demonstration phases begin. The TTP identifies how and when the technology will transfer from AFRL/MLQ to AAC/YBS (or some other EMD/fielding office). This is the same for every initiative under development. The primary user (typically Air Combat Command) allocates AF POM funding in anticipation/coordination of the TTP for transition to 6.4 and production dollars. Some projects are leveraged with other sponsoring agencies (e.g. Technical Support Working Group) that have their own technology transition office that offers a secondary avenue for an acquisition strategy to reach other federal agencies. A third strategy involves the documentation and drawings that can be offered to industry as a build-to-print option as was the case with the All-purpose Remote Transport System

Air Force Research Laboratory, \$5.200 million Tyndall AFB, Florida

**E. Major Performers:**

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Applied Research Associates  
Wintec Incorporated  
University of Florida  
Titan Corporation

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                                  |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | RACS                  |               |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYs<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| Primary Hardware Development                                       |                              |                                      |                                  | 0.870        |                       | 0.530        |                       | 0.610         |                       |                     |               |                                |  |
| Ancilliary Hardware Development                                    |                              |                                      |                                  | 0.370        |                       | 0.320        |                       | 0.640         |                       |                     |               |                                |  |
| Systems Engineering  |                              |                                      |                                  | 0.370        |                       | 0.320        |                       | 0.640         |                       |                     |               |                                |  |
| Licenses   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Tooling  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Award Fees   |                              |                                      |                                  | 0.130        |                       | 0.130        |                       | 0.130         |                       |                     |               |                                |  |
| Subtotal Product Development                                       |                              |                                      |                                  | 1.740        |                       | 1.300        |                       | 2.030         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Development Support  |                              |                                      |                                  | 0.440        |                       | 0.230        |                       | 0.270         |                       |                     |               |                                |  |
| Software Development   |                              |                                      |                                  | 0.440        |                       | 0.230        |                       | 0.270         |                       |                     |               |                                |  |
| Training Development   |                              |                                      |                                  | 0.060        |                       | 0.100        |                       | 0.100         |                       |                     |               |                                |  |
| Integrated Logistics Support                                       |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Configuration Management   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Technical Data   |                              |                                      |                                  | 0.130        |                       | 0.220        |                       | 0.230         |                       |                     |               |                                |  |
| GFE  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal Support   |                              |                                      |                                  | 1.070        |                       | 0.780        |                       | 0.860         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |

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| Exhibit R-3 Cost Analysis (page 2)                                 |                              |                                      |                                  |              |                       |              | Date:                 | February 2004 |                       |                     |               |                                |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|---------------|-----------------------|---------------------|---------------|--------------------------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              | RACS                  |               |                       |                     |               |                                |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYS<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost  | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |  |
| DT   |                              |                                      |                                  | 0.480        |                       | 0.370        |                       | 0.320         |                       |                     |               |                                |  |
| IOT&E  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Initial Verification Testing                                       |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
|  |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Subtotal T&E   |                              |                                      |                                  | 0.480        |                       | 0.370        |                       | 0.320         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Contractor Engineering Support                                     |                              |                                      |                                  | 0.670        |                       | 0.110        |                       | 0.170         |                       |                     |               |                                |  |
| Government Engineering Support                                     |                              |                                      |                                  | 0.250        |                       | 0.300        |                       | 0.440         |                       |                     |               |                                |  |
| Program Management Support   |                              |                                      |                                  | 0.310        |                       | 0.520        |                       | 0.540         |                       |                     |               |                                |  |
| Program Management Personnel                                       |                              |                                      |                                  | 0.230        |                       | 0.380        |                       | 0.400         |                       |                     |               |                                |  |
| Travel   |                              |                                      |                                  | 0.230        |                       | 0.380        |                       | 0.400         |                       |                     |               |                                |  |
| Labor (Research Personnel)   |                              |                                      |                                  | 0.110        |                       | 0.180        |                       | 0.190         |                       |                     |               |                                |  |
| Miscellaneous  |                              |                                      |                                  | 0.110        |                       | 0.180        |                       | 0.180         |                       |                     |               |                                |  |
| Subtotal Management  |                              |                                      |                                  | 1.910        |                       | 2.060        |                       | 2.310         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |
| Total Cost   |                              |                                      |                                  | 5.200        |                       | 4.500        |                       | 5.520         |                       |                     |               |                                |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |               |                       |                     |               |                                |  |

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| Exhibit R-4, Schedule Profile                               |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |           |      |   |   | Date: February 2004                                     |      |   |           |   |      |   |   |   |      |   |   |   |
|---|------|---|-----------|---|------|---|-----------|---|------|---|-----------|---|------|---|-----------|---|------|---|-----------|-----------|------|---|---|---|------|---|-----------|---|------|---|---|---|------|---|---|---|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |      |   |           |   |      |   |           |   |      |   |           | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |      |   |           |   |      |   |           |           |      |   |   | Project Number and Name<br>RACS – Advancements for ARTS |      |   |           |   |      |   |   |   |      |   |   |   |
| Fiscal Year   | 2001 |   |           |   | 2002 |   |           |   | 2003 |   |           |   | 2004 |   |           |   | 2005 |   |           |           | 2006 |   |   |   | 2007 |   |           |   | 2008 |   |   |   | 2009 |   |   |   |
|   | 1    | 2 | 3         | 4 | 1    | 2 | 3         | 4 | 1    | 2 | 3         | 4   | 1    | 2 | 3         | 4 | 1    | 2 | 3         | 4         | 1    | 2 | 3 | 4   | 1    | 2 | 3         | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |
| Acquisition Milestones                                      |      |   | ▲<br>MS A |   |      |   | ▲<br>MS B |   |      |   | ▲<br>MS A |   |      |   | ▲<br>MS B |   |      |   | ▲<br>MS A | ▲<br>MS C |      |   |   |   |      |   | ▲<br>MS C |   |      |   |   |   |      |   |   |   |
| Prototype Phase   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |           |      |   |   |   |      |   |           |   |      |   |   |   |      |   |   |   |
| User Evaluation   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |           |      |   |   |   |      |   |           |   |      |   |   |   |      |   |   |   |
| EMD   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |           |      |   |   |   |      |   |           |   |      |   |   |   |      |   |   |   |
| Production  |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |   |      |   |           |           |      |   |   |   |      |   |           |   |      |   |   |   |      |   |   |   |

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R-4 Schedule Profile

Main Programs in Advancements for ARTS  
 Remote Water Cutting System  
 Alternate Control System  
 Deployed Nozzle  
 Articulated Remote Manipulation System

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| Exhibit R-4a, Schedule Detail                             |         |   |        | Date: February 2004 |   |        |        |        |  |
|---|---------|---|--------|---------------------|---|--------|--------|--------|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E BA #4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>RACS – Advancements for ARTS |        |        |        |  |
| Schedule Profile  | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005  | FY2006 | FY2007 | FY2008 |  |
| Concept Design  | 1Q      |   |        |                     |   |        |        |        |  |
| Hardware Procurement                                      | 2Q      |   |        |                     |   |        |        |        |  |
| Quality Design and Build                                  | 3Q      |   |        |                     |   |        |        |        |  |
| Developmental (PD&RR) Technical Testing                   | 3Q      |   |        |                     |   |        |        |        |  |
| Transition to System Program Office                       |         | 4Q  |        |                     |   |        |        |        |  |
| Developmental (User) Evaluation                           |         | 4Q  |        |                     |   |        |        |        |  |
| EMD   |         |   |        | 4Q                  |   |        |        |        |  |
| Production  |         |   |        |                     |   | 1Q     |        |        |  |

Main Programs in Advancements for ARTS

Remote Water Cutting System

Alternate Control System

Deployed Nozzle

Articulated Remote Manipulation System

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| Exhibit R-4a, Schedule Detail                             |         |   |        | Date: February 2004 |  |        |        |        |  |
|---|---------|---|--------|---------------------|--|--------|--------|--------|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E BA #4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>RACS – Active Range Clearance |        |        |        |  |
| Schedule Profile  | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005   | FY2006 | FY2007 | FY2008 |  |
| Concept Design  |         | 1Q  |        |                     |  |        |        |        |  |
| Hardware Procurement                                      |         | 2Q  |        |                     |  |        |        |        |  |
| Quality Design and Build                                  |         |   | 3Q     |                     |  |        |        |        |  |
| Developmental (PD&RR) Technical Testing                   |         |   | 4Q     |                     |  |        |        |        |  |
| Transition to System Program Office                       |         |   |        | 2Q                  |  |        |        |        |  |
| Developmental (User) Evaluation                           |         |   |        | 3Q                  |  |        |        |        |  |
| EMD   |         |   |        |                     |  | 3Q     |        |        |  |
| Production  |         |   |        |                     |  |        | 3Q     |        |  |

## R-4a Schedule Profile

Main Programs within Active Range Clearance  
 Automated Ordnance Excavator  
 Remote Standoff Munitions Disruption System  
 Charge Setting System  
 Joint Laser Ordnance Neutralization System  
 Power Rake

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| Exhibit R-4, Schedule Profile                               |      | Date: February 2004 |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
|---|------|---------------------|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|--|--|--|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |      |                     |   |   |      |   |   | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |      |   |   |   |      |   |   | Project Number and Name<br>RACS – Advanced Robotics Systems |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Fiscal Year   | 2001 |                     |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |   | 2006 |   |   |   | 2007 |   |   |   | 2008 |   |   |   | 2009 |   |   |   |  |  |  |  |
|   | 1    | 2                   | 3 | 4 | 1    | 2 | 3 | 4   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4   | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |  |  |  |  |
| Acquisition Milestones                                      |      |                     |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Prototype Phase   |      |                     |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| EMD   |      |                     |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Production  |      |                     |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |

Deleted: B

R-4 Schedule Profile

Main Programs include  
 Advanced Navigation capabilities  
 Object Detection/Avoidance  
 Multi-vehicle control  
 Marsupial Control  
 Path Planning/Execution  
 JAUS Compliance, Testing, and Evaluation

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| Exhibit R-4a, Schedule Detail                             |         |   |        | Date: February 2004 |   |        |        |        |  |
|---|---------|---|--------|---------------------|---|--------|--------|--------|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E BA #4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>RACS – Advanced Robotics Systems |        |        |        |  |
| Schedule Profile  | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005  | FY2006 | FY2007 | FY2008 |  |
| Concept Design  | 1Q      |   |        |                     |   |        |        |        |  |
| Hardware Procurement                                      |         |   | 1Q     |                     |   |        |        |        |  |
| Quality Design and Build                                  |         |   |        |                     | 1Q  |        |        |        |  |
| Developmental (PD&RR) Technical Testing                   |         |   |        |                     |   |        | 1Q     |        |  |
| Transition to System Program Office                       |         |   |        |                     |   |        |        | 1Q     |  |
| EMD   |         |   |        |                     |   |        |        | 1Q     |  |
| Production  |         |   |        |                     |   |        |        |        |  |

R-4a Schedule Profile

Main Programs include  
 Advanced Navigation capabilities  
 Object Detection/Avoidance  
 Multi-vehicle control  
 Marsupial Control  
 Path Planning/Execution  
 JAUS Compliance, Testing, and Evaluation

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| Exhibit R-4a, Schedule Detail                             |         |   |        | Date: February 2004 |  |        |        |        |  |
|---|---------|---|--------|---------------------|--|--------|--------|--------|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E BA #4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>RACS – Next Generation Explosive Ordnance Disposal<br>Remote Control Vehicle (NGEODRCV) |        |        |        |  |
| Schedule Profile  | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005   | FY2006 | FY2007 | FY2008 |  |
| Concept Design  |         | 1Q  |        |                     |  |        |        |        |  |
| Hardware Procurement                                      |         |   | 1Q     |                     |  |        |        |        |  |
| Quality Design and Build                                  |         |   |        | 1Q                  |  |        |        |        |  |
| Developmental (PD&RR) Technical Testing                   |         |   |        |                     | 1Q   |        |        |        |  |
| Transition to System Program Office                       |         |   |        |                     |  | 4Q     |        |        |  |
| EMD   |         |   |        |                     |  |        | 1Q     |        |  |
| Production  |         |   |        |                     |  |        |        | >>     |  |

R-4a Schedule Profile

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| Exhibit R-4a, Schedule Detail                             |         |   |        | Date: February 2004 |   |        |        |        |  |
|---|---------|---|--------|---------------------|---|--------|--------|--------|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E BA #4 |         | Program Element Number and Name<br>PE 0603709D8Z Joint Robotics Program |        |                     | Project Number and Name<br>RACS – Force Protection Robotics |        |        |        |  |
| Schedule Profile  | FY 2001 | FY 2002   | FY2003 | FY2004              | FY2005  | FY2006 | FY2007 | FY2008 |  |
| Concept Design  |         | 1Q  |        |                     |   |        |        |        |  |
| Hardware Procurement                                      |         |   | 3Q     |                     |   |        |        |        |  |
| Quality Design and Build                                  |         |   | 4Q     |                     |   |        |        |        |  |
| Developmental (PD&RR) Technical Testing                   |         | 4Q  |        | 1Q                  |   |        |        |        |  |
| Transition to System Program Office                       |         |   |        |                     | 4Q  |        |        |        |  |
| EMD   |         |   |        |                     |   |        | 3Q     |        |  |
| Production  |         |   |        |                     |   |        |        |        |  |

R-4a Schedule Profile

Main Programs include  
REDCAR  
DTRA  
STORK

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| Exhibit R-2a, RDT&E Budget Item Justification            |         |         |         |   | Date: February 2004 |         |         |
|--|---------|---------|---------|---|---------------------|---------|---------|
| APPROPRIATION/BUDGET ACTIVITY<br>DEFENSE WIDE RDT&E BA 4 |         |         |         | R-1 ITEM<br>NOMENCLATURE PE 0603709D8Z<br>JOINT ROBOTICS<br>PROGRAM |                     |         |         |
| COST (\$ in millions)                                    | FY 2003 | FY 2004 | FY 2005 | FY 2006   | FY 2007             | FY 2008 | FY 2009 |
| COTS   | 3.292   | 2.086   | 0.200   | 0.200   | 0.000               | 0.000   | 0.000   |

## A. Mission Description and Budget Item Justification:

The Commercial-off-the-Shelf (COTS) program is new for the JRP. Its purpose is to create a pool of small, mobile robots that will be made available on loan to government agencies, laboratories and universities. The goal of COTS is to assist agencies in defining their requirements, modifying their operational practices, and to make more appropriate acquisitions of unmanned systems. The robots that populate the pool will be COTS systems currently available from several manufacturers. The evaluations and experiments conducted with COTS robots will provide valuable feedback for future small robot developments. In requesting the loan of small robots from COTS, priority will go to Department of Defense, Homeland Security, and Emergency Response users. Where appropriate, COTS systems will be supplemented with unique developmental technologies to address emerging operational and programmatic requirements, for example, extensions to COTS systems in support of OEF/OIF.

## B. Accomplishments/Planned Program

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 3.292   | 0.000   | 0.000   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Accomplishments for FY 2003 include:
  - Robotic Systems Pool Chartered; Tri-Service Management Board established to provide guidance and vet requests for support.
  - Robotic Systems Pool Standard Operating Procedures approved by JRP Managers.
  - Loans made to the following organizations:
    - Joint Project Office Unmanned Ground Vehicle Systems
    - Navy EOD Mobile Unit Three
    - US Army 82<sup>nd</sup> Airborne
    - US Army Infantry Schools Command

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- US Army Corps of Engineers
- Center for Robot Assisted Search and Rescue (CRASAR)
- San Diego Metro Arson Strike Team
- Las Vegas Metropolitan Police Department
- Supported research completed at SPAWAR Systems Center San Diego on ground robot RF communications and data to determine optimum frequency and bandwidth for operations.
- Collected, organized, and posted user feedback to on-line website.
- Provided training for US Army, US Navy, San Diego County Sheriff, San Diego Metro Arson Strike Team, and Las Vegas Metropolitan Police Department SWAT.
- Responded to 55 requests for robot loans and operational support.
- Procurement of 15 new robotic systems and support equipment including fiber-optic spoolers, operator control units, and spares. (iRobot)
- Development/procurement and rapid equipment fielding of four chemical/radiation/gas sensor suites for small robotic systems. (iRobot)
- Enhancements to the (BBN) Ad Hoc Networking Radios used in small robotic systems including:
  - A new driver for the Cisco 802.11b card (with diversity antennas).
  - A study of power requirements for the ad hoc networking radios.
  - A power distribution/charging circuit for the radio.
  - A link-quality/connectivity graphic visualization program for the ad hoc network.
  - A centralized relay brick deployment program.
- Development/procurement of a miniature perimeter surveillance radar that is less than half the size of the current model (PSRS) and detects human-sized intruders with 360 degrees of horizontal coverage and up to a range of 100m. The delivered system operates standalone or as payload component on man-portable UGS/backpackable robots with applications for force protection and remote sensing. Since its primary sensor is based on dual-use obstacle avoidance technology for the automotive industry (e.g. tractor trailers), the estimated per unit cost in production will be a fraction of the current model. (STS)
- Development/procurement of a miniature stereo, vision-based obstacle detection and collision avoidance sensor used for small mobile robot navigation. This sensor will be used on a variety of small robots to aide in autonomous mobility to enhance the effectiveness of small mobile robots. (JPL)
- Development/procurement of a novel unmanned ground vehicle with configurable/adaptable mobility modes. (ACEi)

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- o Development of advanced small mobile robot autonomous navigation capabilities. Allows for autonomous mobility using high-resolution sensors such as LASERs. The software has been transferred to COTS small robots. (INEEL)
- o Development of an interface to the GOTS Common Geospatial Navigation Toolkit (COGENT) that allows NIMA Digital Nautical Charts to be displayed by other software application programs. This interface will be used in robotic operator control units. (SPAWAR Systems Center Charleston)

|   | FY 2003 | FY 2004 | FY 2005 |
|---|---------|---------|---------|
| Accomplishment/Effort/Subtotal Cost       | 0.000   | 0.200   | 0.200   |
| RDT&E Articles Quantity * (as applicable) |         |         |         |

- Plans for FY 2004-2005 include:
  - o Procure off-the-shelf small robots for loan to government agencies, laboratories, and universities. Several configurations will be procured. Payloads that offer additional capabilities to address emerging threats/needs will be pursued.
  - o Collection of performance data to provide feedback to developers for the improvement of COTS systems and technologies.
  - o Provide advice, maintenance, and training to the requesting agencies.
  - o Continue maintenance, upgrades, and support as required.

**C. Other Program Funding Summary:**

Not Applicable

**D. Acquisition Strategy:**

Not Applicable

**E. Major Performers:**

Not Applicable

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| Exhibit R-3 Cost Analysis (page 1)                                 |                              |                                      |                 |              |                       |              | Date:                 |              | February 2004         |                     |               |                                |
|--|------------------------------|--------------------------------------|-----------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------------|---------------|--------------------------------|
| DEFENSE-WIDE   |                              |                                      | Program Element |              |                       |              | COTS                  |              |                       |                     |               |                                |
| BUDGET ACTIVITY 4  |                              |                                      | PE 0603709D8Z   |              |                       |              |                       |              |                       |                     |               |                                |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>Cost   | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |
| COTS System Procurement  |                              |                                      |                 | 3.292        |                       | 1.186        |                       |              |                       |                     |               |                                |
| Ancilliary Hardware Development                                    |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Systems Engineering  |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Licenses   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Tooling  |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| GFE  |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Award Fees   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal Product Development                                       |                              |                                      |                 | 3.292        |                       | 1.186        |                       | 0.000        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Development Support  |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Software Development   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Training Development   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Integrated Logistics Support                                       |                              |                                      |                 |              |                       | 0.200        |                       | 0.200        |                       |                     |               |                                |
| Configuration Management   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Technical Data   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| GFE  |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |
| Subtotal Support   |                              |                                      |                 | 0.000        |                       | 0.200        |                       | 0.200        |                       |                     |               |                                |
| Remarks:   |                              |                                      |                 |              |                       |              |                       |              |                       |                     |               |                                |

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| Exhibit R-3 Cost Analysis (page 2)                                 |                              |                                      |                                  |              |                       |              |                       |              |                       |                     | Date:         |                                | February 2004 |  |
|--|------------------------------|--------------------------------------|----------------------------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------------|---------------|--------------------------------|---------------|--|
| DEFENSE-WIDE<br>BUDGET ACTIVITY 4                                  |                              |                                      | Program Element<br>PE 0603709D8Z |              |                       |              |                       | COTS         |                       |                     |               |                                |               |  |
| Cost Categories<br>(Tailor to WBS, or System/Item<br>Requirements) | Contract<br>Method &<br>Type | Performing<br>Activity &<br>Location | Total<br>PYS<br>Cost             | 2003<br>Cost | 2003<br>Award<br>Date | 2004<br>Cost | 2004<br>Award<br>Date | 2005<br>Cost | 2005<br>Award<br>Date | Cost To<br>Complete | Total<br>Cost | Target<br>Value of<br>Contract |               |  |
| DT   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| IOT&E  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Initial Verification Testing                                       |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
|  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
|  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
|  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Subtotal T&E   |                              |                                      |                                  | 0.000        |                       | 0.000        |                       | 0.000        |                       |                     |               |                                |               |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Contractor Engineering Support                                     |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Government Engineering Support                                     |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Program Management Support   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Program Management Personnel                                       |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Travel   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Labor (Research Personnel)   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Miscellaneous  |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Subtotal Management  |                              |                                      |                                  | 0.000        |                       | 0.000        |                       | 0.000        |                       |                     |               |                                |               |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |
| Total Cost   |                              |                                      |                                  | 3.292        |                       | 2.086        |                       | 0.200        |                       |                     |               |                                |               |  |
| Remarks:   |                              |                                      |                                  |              |                       |              |                       |              |                       |                     |               |                                |               |  |

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| Exhibit R-4, Schedule Profile                                |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   | Date: February 2004 |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
|--|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---------------------------------|------|---|---|---|---------------------|---|---|---|------|---|---|---|------|---|---|---|--|--|--|--|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4  |      |   |   |   |      |   |   |   |      | Program Element Number and Name<br>PE 0603709D8Z – Joint Robotics Program |   |   |      |   |   |   |      |   |   | Project Number and Name<br>COTS |      |   |   |   |                     |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Fiscal Year  | 2001 |   |   |   | 2002 |   |   |   | 2003 |   |   |   | 2004 |   |   |   | 2005 |   |   |                                 | 2006 |   |   |   | 2007                |   |   |   | 2008 |   |   |   | 2009 |   |   |   |  |  |  |  |
|  | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2   | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4                               | 1    | 2 | 3 | 4 | 1                   | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |  |  |  |  |
| Procure<br>COTS<br>Systems                                   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |                     |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Perform<br>Maintenance,<br>Training<br>Support &<br>Upgrades |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |      |   |   |                                 |      |   |   |   |                     |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |

R-4 Schedule Profile

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| Exhibit R-4a, Schedule Detail                               |         |  |        | Date: February 2004 |                                 |        |        |        |
|---|---------|--|--------|---------------------|---------------------------------|--------|--------|--------|
| Appropriation/Budget Activity<br>DEFENSE WIDE RDT&E/B.A. #4 |         | Program Element Number and Name<br>PE 0603709DZ Joint Robotics Program |        |                     | Project Number and Name<br>COTS |        |        |        |
|   | FY 2001 | FY 2002  | FY2003 | FY2004              | FY2005                          | FY2006 | FY2007 | FY2008 |
| Procure COTS Systems  |         |  | 1-4Q   |                     |                                 |        |        |        |
| Maintenance, Training, Support                              |         |  | Cont.  | Cont.               | Cont.                           | Cont.  |        |        |

R-4a Schedule Profile

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