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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2012 Defense Advanced Research Projects Agency **DATE:** February 2011

<b>APPROPRIATION/BUDGET ACTIVITY</b>				<b>R-1 ITEM NOMENCLATURE</b>							
0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide</i> BA 3: <i>Advanced Technology Development (ATD)</i>				PE 0603768E: <i>GUIDANCE TECHNOLOGY</i>							
<b>COST (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	33.570	-	-	-	-	-	-	-	-	Continuing	Continuing
GT-01: <i>GUIDANCE TECHNOLOGY</i>	21.152	-	-	-	-	-	-	-	-	Continuing	Continuing
GT-CLS: <i>CLASSIFIED</i>	12.418	-	-	-	-	-	-	-	-	Continuing	Continuing

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

The Guidance Technology program element is budgeted in the Advanced Technology Development Budget Activity because it is developing system oriented technologies that will improve our ability to navigate weapon systems with more precision and increase the capability to meet current and emerging threats. Consequently, this program element is merging with the Sensors Technology program element in FY 2011. Many of the guidance programs have ended eliminating the need for such a specifically focused program element.

The Guidance Technology project increases the ability of Global Positioning System (GPS) users to operate effectively in the presence of enemy jamming; to increase the versatility of navigation systems applications by developing microelectromechanical sensor inertial navigation system technologies; and to apply the geolocation technologies/techniques to precision threat geolocation of short-dwell emitters or passive air defense systems.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>
Previous President's Budget	36.886	-	-	-	-
Current President's Budget	33.570	-	-	-	-
Total Adjustments	-3.316	-	-	-	-
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-2.338	-			
• SBIR/STTR Transfer	-0.978	-			

**Change Summary Explanation**

FY 2010: Decrease reflects internal below threshold reprogramming and SBIR/STTR transfer.

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**Exhibit R-2A, RDT&E Project Justification:** PB 2012 Defense Advanced Research Projects Agency **DATE:** February 2011

<b>APPROPRIATION/BUDGET ACTIVITY</b>				<b>R-1 ITEM NOMENCLATURE</b>				<b>PROJECT</b>			
0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide</i> BA 3: <i>Advanced Technology Development (ATD)</i>				PE 0603768E: <i>GUIDANCE TECHNOLOGY</i>				GT-01: <i>GUIDANCE TECHNOLOGY</i>			
<b>COST (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012 Base</b>	<b>FY 2012 OCO</b>	<b>FY 2012 Total</b>	<b>FY 2013</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
GT-01: <i>GUIDANCE TECHNOLOGY</i>	21.152	-	-	-	-	-	-	-	-	Continuing	Continuing

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

Fire-and-forget stand-off weapons need precise targeting information if critical fixed and mobile targets are to be eliminated effectively with minimal collateral damage and minimum cost-per-kill. This requires that: 1) military surveillance and targeting systems geolocate targets accurately in the same coordinate system in which the weapon system navigates; 2) the surveillance, targeting and weapon systems have precision navigation and guidance systems on-board; and 3) navigation and target location systems robustly operate day/night and in adverse weather. In addition, future systems designed to accomplish precision strike missions must be significantly more affordable. Thrusts are included in this project to improve our ability to navigate when the Global Positioning System (GPS) is jammed or otherwise unavailable; to increase the versatility of navigation systems applications by developing microelectromechanical sensor inertial navigation system technologies; and to apply the geolocation technologies/techniques to precision threat geolocation of short-dwell emitters or passive air defense systems.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012</b>
<p><b>Title:</b> Multifunctional Electro-Optics for Defense of U.S. Aircraft (MEDUSA)</p> <p><b>Description:</b> The Multifunction Electro-Optics for Defense of U.S. Aircraft (MEDUSA) program developed the technologies and systems to give the U.S. air dominance at low altitude and at night. This program developed technologies to leap-frog reactive end-game countermeasures and enable increased threat warning times, denial of launch, and put Electro Optical-Infrared (EO-IR) air defense threats at risk in the Near Infrared (NIR), Mid-wave Infrared (MWIR) and Long-wave Infrared (LWIR) regimes. MEDUSA 1) conducted phenomenological measurements and developed countermeasures and target classification/identification techniques; 2) developed critical component technologies such as high-power IR laser sources, advanced IR detectors, and fibers for high-power IR transmission; and 3) developed and demonstrated an end-to-end MEDUSA system. The MEDUSA technology is available for transition to the Air Force and Army.</p> <p><b>FY 2010 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Completed design and fabrication of large format 256x256 Near/Mid-Wave Infrared (NMIR) detector and Readout Integrated Circuits (ROICs) supporting proactive Infrared Counter Measure (IRCM) and other applications.</li> <li>- Completed laboratory and outdoor testing of hybridized 128x128 NMIR detector arrays and ROICs.</li> <li>- Performed analysis of measured-range precision demonstrated by the 128x128 focal plane arrays.</li> </ul>	7.460	-	-
<p><b>Title:</b> Robust Surface Navigation (RSN)</p> <p><b>Description:</b> The Robust Surface Navigation (RSN) program will provide the U.S. warfighter with the ability to navigate effectively when the Global Positioning System (GPS) is unavailable due to hostile action (e.g. jamming) or blockage by structures and</p>	5.239	-	-

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<b>APPROPRIATION/BUDGET ACTIVITY</b> 0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide</i> BA 3: <i>Advanced Technology Development (ATD)</i>	<b>R-1 ITEM NOMENCLATURE</b> PE 0603768E: <i>GUIDANCE TECHNOLOGY</i>	<b>PROJECT</b> GT-01: <i>GUIDANCE TECHNOLOGY</i>	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2010</b>	<b>FY 2011</b>
<p>foliage. The RSN program will use Signals of Opportunity (SoOP) from a variety of ground, air, and space-based sources, augmented by judiciously placed RF beacons. These will be received on the warfighter's forthcoming software defined radios and use specially tailored algorithms to determine position. The greater strength and diversity of these signals will provide coverage when GPS is denied due to environmental conditions or hostile activity. This is a two-part program: (1) cataloging and assessing potential exploitable signals followed by analysis and performance modeling and hardware-based concept validation, and; (2) designing, testing, and demonstrating a (non-form-fit) prototype receiver(s) and algorithms for geolocation using the SoOP. Beginning in FY 2011, this program is budgeted in PE 0603767E, Project SEN-01. The RSN technology is planned for transition to the U.S. Special Operations Command (SOCOM) and the U.S. Army with specific elements of the program transitioning to the U.S. Navy and U.S. Air Force.</p> <p><b>FY 2010 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Initiated development of RSN prototype system and planning for field tests and demonstrations in dense urban environments, including within large buildings and urban canyons.</li> <li>- Developed test plan for total system readiness demonstration.</li> <li>- Conducted Critical Design Review in preparation for development of non-form-fit prototype system.</li> </ul>			
<p><b>Title:</b> Sub-Surface Navigation (SsN)</p> <p><b>Description:</b> Building on technologies developed under the RSN program, the Sub-Surface Navigation (SsN) program provided the U.S. warfighter with the ability to navigate effectively underground, where the Global Positioning System (GPS) is unavailable. SsN also enables long endurance or covert underground missions where alternative navigation aids like inertial measurement units (IMUs) or inertial navigation units (INUs) are unsuitable. The SsN program uses specialized low frequency RF beacons and specially tailored algorithms to provide 3-dimensional navigation of personnel and mobile platforms underground. The greater strength and diversity of these signals provide coverage when GPS is denied due to lack of penetration through the earth. The SsN technology is available for transition to the U.S. Special Operations Command (SOCOM).</p> <p><b>FY 2010 Accomplishments:</b></p> <ul style="list-style-type: none"> <li>- Completed experimental measurements to support design and development of next generation, small form-factor beacon antenna design.</li> <li>- Demonstrated underground navigation using beacon-based system.</li> </ul>		1.812	-
<p><b>Title:</b> Precision Inertial Navigation Systems (PINS)</p> <p><b>Description:</b> The Precision Inertial Navigation Systems (PINS) program developed an entirely new class of inertial navigation instruments using atomic inertial force sensors. These sensors utilize the quantum-mechanical wave-like nature of atoms in the</p>		6.641	-

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2010</b>	<b>FY 2011</b>	<b>FY 2012</b>
<p>atomic analogue of an optical interferometer to provide unprecedented sensitivity to accelerations and rotations. The atomic sensors measure the local gravitational field gradient to ensure that instrument alignment is properly maintained throughout vehicle maneuver, thus mitigating gravity-induced navigation errors. While originally planned for transition to the Navy at the conclusion of Phase III, program developments indicate opportunities for insertion in multiple Service applications and plans are being revised accordingly.</p> <p><b><i>FY 2010 Accomplishments:</i></b></p> <ul style="list-style-type: none"> <li>- Completed study of technical hurdles preventing 200 hour continuous sensor system operation and designed system changes to address key items identified.</li> <li>- Devised transition plan for technology insertion consistent with Department of Defense Positioning, Navigation, and Timing roadmap.</li> </ul>			
<b>Accomplishments/Planned Programs Subtotals</b>	21.152	-	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**D. Acquisition Strategy**

N/A

**E. Performance Metrics**

Specific programmatic performance metrics are listed above in the program accomplishments and plans section.

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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
GT-CLS: <i>CLASSIFIED</i>	12.418	-	-	-	-	-	-	-	-	Continuing	Continuing

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

This project funds classified DARPA programs that are reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2010	FY 2011	FY 2012
<b>Title:</b> Classified DARPA Program	12.418	-	-
<b>Description:</b> This project funds Classified DARPA Programs. Details of this submission are classified.			
<b>FY 2010 Accomplishments:</b> Details will be provided under separate cover.			
<b>Accomplishments/Planned Programs Subtotals</b>	12.418	-	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**D. Acquisition Strategy**

N/A

**E. Performance Metrics**

Details will be provided under separate cover.