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Exhibit R-2, PB 2010 Office of Secretary Of Defense RDT&E Budget Item Justification **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE					
0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 3 - Advanced Technology Development (ATD)					PE 0603745D8Z Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)					
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	3.368	7.940	4.864						Continuing	Continuing
P745: Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)	3.368	7.940	4.864						Continuing	Continuing

A. Mission Description and Budget Item Justification

The Synthetic Aperture Radar (SAR) Coherent Change Detection (CCD) Initiative encompasses four phases to develop deployable systems capable of achieving SAR with real time Coherent Change Detection for tactical intelligence. The first phase, completed in FY2008, validated the utility of existing small SAR sensors for use as a CCD platform. CCD post processing was used to establish current SAR capabilities for change detection thresholds. Phase Two will demonstrate real-time CCD on a manned, SAR-equipped, platform. This real time enhancement will be capable of being retro fitted on existing manned SAR platforms. Phase Three will develop the engineering enhancements necessary to integrate a real time SAR CCD capability on a small unmanned aerial vehicle (UAV). All necessary software will be developed during this phase. The fourth phase will extend the capability to an affordable small unmanned aircraft with a miniaturized SAR system. The goal is to develop a deployable system with a SAR sensor capable of achieving real time CCD on a small UAV to be tested by the tactical commander and at a cost of \$500K per SAR CCD sensor package.

B. Program Change Summary (\$ in Millions)

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>
Previous President's Budget	3.469	7.984	4.953	
Current BES/President's Budget	3.368	7.940	4.864	
Total Adjustments	-0.101	-0.044	-0.089	
Congressional Program Reductions				
Congressional Rescissions		-0.044		
Total Congressional Increases				
Total Reprogrammings				
SBIR/STTR Transfer	-0.094			
Undistributed reductions	-0.007			
Internal realignment of funds			-0.025	
Other			-0.064	

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Exhibit R-2a, PB 2010 Office of Secretary Of Defense RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 0400 - Research, Development, Test & Evaluation, Defense-Wide/BA 3 - Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603745D8Z Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)					PROJECT NUMBER P745	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
P745: Synthetic Aperture Radar (SAR) Coherent Change Detection (CDD)	3.368	7.940	4.864						Continuing	Continuing

A. Mission Description and Budget Item Justification

The Synthetic Aperture Radar (SAR) Coherent Change Detection (CCD) Initiative encompasses four phases to develop deployable systems capable of achieving SAR with real time Coherent Change Detection for tactical intelligence. The first phase, completed in FY2008, validated the utility of existing small SAR sensors for use as a CCD platform. CCD post processing was used to establish current SAR capabilities for change detection thresholds. Phase Two will demonstrate real-time CCD on a manned, SAR-equipped, platform. This real time enhancement will be capable of being retro fitted on existing manned SAR platforms. Phase Three will develop the engineering enhancements necessary to integrate a real time SAR CCD capability on a small unmanned aerial vehicle (UAV). All necessary software will be developed during this phase. The fourth phase will extend the capability to an affordable small unmanned aircraft with a miniaturized SAR system. The goal is to develop a deployable system with a SAR sensor capable of achieving real time CCD on a small UAV to be tested by the tactical commander and at a cost of \$500K per SAR CCD sensor package.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Validate the Utility of SAR CCD SAR with real-time CCD will have the ability to detect the following activities with actual detection metrics that were determined and tested during Phase I: - Vehicle tracks due to a vehicle recently driving off-road, such as across a median strip, or adjacent to a paved road. - Human(s) having recently traversed a path on soft soil, underbrush or vegetation. - Detection of linear structures newly-emplaced, such as a small diameter pipe. - Ground displacement due to trenching or the movement of dirt along a path. - The addition or subtraction of a significant object visible to the sensor, covering a half square meter, or providing a significant change in radar cross section (reflectivity). - Ground displacement due to digging operations, or digging and soil replacement, or repaving operations, where the ground area of the displaced earth covers a square meter or more. - The displacement of guard barriers, or other objects, due to manual manipulation, or vehicle crashes.	0.750	0.000	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>- Ground level subsidence due to underground excavation activities when the surface subsidence amounts to a few millimeters. The first phase validated the utility of small SAR sensors for use in CCD processing. Phase I also determined the current actual capabilities of CCD in tactical change detection.</p> <p><i>FY 2008 Accomplishments:</i> Validated the utility of small SAR systems with CCD post processing for intelligence gathering.</p>				
<p>Demonstration of a manned platform system</p> <p>Phase 2 will accomplish the following: 1) Engineering of algorithms necessary to exploit complex Synthetic Aperture Radar (SAR) imagery. 2) Initial development of ground based software package to cue user to tactically significant changes in the area of interest. 3) Demonstration of near real time Synthetic Aperture Radar Coherent Change Detection (SAR CCD) capability on a manned aircraft. 4) Initial Concept of Operations (CONOPS) development.</p> <p><i>FY 2008 Accomplishments:</i> Continued Phase I efforts, and began Phase II efforts.</p> <p><i>FY 2009 Plans:</i> Demonstrate a real-time CCD capability on a manned SAR platform system with a radar and processing capability that can produce real-time SAR CCD, together with a design for a deployable objective system.</p>	2.618	2.102	0.000	
<p>Develop the engineering enhancements</p> <p>Phase 3 will accomplish the following: 1) Miniaturization of a Synthetic Aperture Radar Coherent Change Detection (SAR CCD) capability such that the sensor package is capable of deployment on a tactical sized UAV. 2) Further enhancements to the front-end software package user experience. 3) Refinement of Concept of Operations (CONOPS) initially developed in Phase 2.</p>	0.000	5.838	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p><i>FY 2009 Plans:</i> This phase will develop the necessary reduction in SAR component size necessary to facilitate integration of real-time CCD systems into a small UAV.</p>				
<p>Extend capability</p> <p>Phase 4 will accomplish the following:</p> <ol style="list-style-type: none"> 1) A robust Concept of Operations (CONOPS). 2) A front-end software package with a rich user experience. 3) A near real time Synthetic Aperture Radar Coherent Change Detection (SAR CCD) capability integrated on to a tactical sized UAV with a sensor package cost of not more than \$500 thousand. <p><i>FY 2010 Plans:</i> This phase of the program will integrate a SAR with real time CCD capability to a small UAV for \$500 thousand per sensor package.</p>	0.000	0.000	4.864	
C. Other Program Funding Summary (\$ in Millions) N/A				
D. Acquisition Strategy N/A				
E. Performance Metrics N/A				

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