Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Defense Advanced Research Projects Agency	DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602305E: *MACHINE INTELLIGENCE*

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
Total Program Element	34.773	52.276	-	-	-	-	-	-	-	Continuing	Continuing
MCN-01: *MACHINE INTELLIGENCE*	34.773	52.276	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Machine Intelligence project is developing technologies that will enable computing systems to extract and encode information from dynamic and stored data, observations, and experience, and to derive new knowledge, answer questions, reach conclusions, and propose explanations. Enabling computing systems with machine intelligence is now of critical importance because sensor, information, and communication systems continuously generate and deliver data at rates beyond which humans can assimilate, understand, and act. This explosion in available data/information ("big data"), combined with the ready availability of inexpensive mass storage and ubiquitous, inexpensive, computation-on-demand, provide the foundation for entirely new machine intelligence capabilities.

B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	44.682	61.351	52.276	-	52.276
Current President's Budget	34.773	52.276	-	-	-
Total Adjustments	-9.909	-9.075	-52.276	-	-52.276
• Congressional General Reductions	-0.227	-			
• Congressional Directed Reductions	-	-9.075			
• Congressional Rescissions	-0.292	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-8.240	-			
• SBIR/STTR Transfer	-1.150	-			
• TotalOtherAdjustments	-	-	-52.276	-	-52.276

Change Summary Explanation

FY 2011: Decrease reflects the Section 8117 Economic Adjustment, internal below threshold reprogrammings, rescissions and the SBIR/STTR transfer.
FY 2012: Decrease reflects reduction for unsustained growth.
FY 2013: Decrease reflects the end of machine reading and visual intelligence efforts and the transfer of the Visual Media Reasoning Program to PE 0602702E, Project TT-13.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Title: Machine Reading and Reasoning Technology	20.484	24.359	-

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Description: The Machine Reading and Reasoning Technology program will develop enabling technologies to acquire, integrate, and use high performance reasoning strategies in knowledge-rich domains. Such technologies will provide DoD decision makers with rapid, relevant knowledge from a broad spectrum of sources that may be dynamic and/or inconsistent. To address the significant challenges of context, temporal information, complex belief structures, and uncertainty, new capabilities are needed to extract key information and metadata, and to exploit these via context-capable search and inference. Cognitive inference has traditionally emphasized deduction via theorem-proving and induction via statistical techniques, but abduction - also known as "inference to the best explanation"- is also likely to play a large role. ***FY 2011 Accomplishments:*** - Extended knowledge extraction capabilities of machine reading systems to acquire simple relationship information in addition to factual data. - Demonstrated generality of machine reading systems through introduction of multiple domains. - Developed knowledge extraction, representation, and reasoning capabilities to support spatial, temporal, and event reasoning. - Began developing a military transition with DoD organization focused on semantic understanding of heterogeneous knowledge sources in a targeted domain. ***FY 2012 Plans:*** - Develop capability to automatically learn reading patterns by addressing ambiguity resolution and discovering inference patterns. - Demonstrate temporal reasoning over facts and events extracted from text. - Validate scalability of machine reading systems to new domains through introduction of hidden topical domains. - Apply machine reading technology to operations of transition customer.			
Title: Mind's Eye ***Description:*** The Mind's Eye program is developing a machine-based capability to learn generative representations of action between objects in a scene, directly from visual inputs, and then to reason over those learned representations. Mind's Eye will create the perceptual and cognitive underpinnings for reasoning about the action in scenes, enabling the generation of a narrative description of the action taking place in the visual field. The technologies developed under Mind's Eye have applicability in automated ground-based surveillance systems. ***FY 2011 Accomplishments:*** - Created initial visual intelligence prototype systems and demonstrated utility for autonomous reporting by generating narrative descriptions for every video in an 8,000+ video dataset with recognition performance comparable to humans.	10.000	16.000	-

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Developed and optimized visual intelligence algorithms for use by smart camera systems. ***FY 2012 Plans:*** - Develop improved visual intelligence capabilities based on initial assessments and evaluate on additional relevant datasets. - Integrate visual intelligence into a prototype smart camera and perform concept demonstration.			
Title: Visual Media Reasoning (VMR)* ***Description:*** *Previously Web-Scale Information Integration The Visual Media Reasoning (VMR) program will create technologies to automate the analysis of enemy-recorded photos and videos and identify, within minutes, key information related to the content. Such identification will include the names of individuals within the image (who), the enumeration of the objects within the image and their attributes (what), and the image's geospatial location and time frame (where and when). Large data stores of enemy photos and video are available but cannot be easily leveraged by a warfighter or analyst attempting to understand a specific new image. The VMR program will enable users to gain insights rapidly through application of highly parallelized image analysis techniques that can process the imagery in massive federated image stores. VMR technology will serve as a force-multiplier by rapidly and automatically extracting tactically relevant information for the human analyst and alerting the analyst to scenes that warrant the analyst's expert attention. This effort will be funded in PE 0602702E, Project TT-13 beginning in FY 2013. ***FY 2011 Accomplishments:*** - Identified operational imagery analysis scenarios (use cases), needs, and constraints. - Conceptualized approaches for automatically analyzing enemy-recorded photos and videos. - Explored potential partnerships with DoD/IC agencies. ***FY 2012 Plans:*** - Create application programming interfaces (APIs) as the basis for an open architecture that facilitates integrating new computer vision algorithms. - Demonstrate and integrate algorithms into a single system. - Identify and quantify the desired levels of operational accuracy and performance for each of the areas: Who, What, Where and When, using feedback from the warfighter/analyst user group.	4.289	11.917	-
Accomplishments/Planned Programs Subtotals	34.773	52.276	-

D. Other Program Funding Summary ($ in Millions)

N/A

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E. Acquisition Strategy

N/A

F. Performance Metrics

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