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Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Air Force										Date: February 2015		
Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0305164F I NAVSTAR Global Positioning System (User Equipment) (SPACE)							
COST (\$ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
Total Program Element	63.687	123.081	156.221	142.288	-	142.288	219.043	221.884	189.800	171.827	55.700	1,343.531
643833: MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP	63.687	123.081	156.221	142.288	-	142.288	219.043	221.884	189.800	171.827	55.700	1,343.531
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 447												
A. Mission Description and Budget Item Justification												
The Global Positioning System (GPS) is a space-based radio Positioning, Navigation, and Time (PNT) distribution system. GPS User Equipment (UE) consists of standardized receivers, antennas, antenna electronics, etc., grouped together in sets to derive navigation and time information transmitted from GPS satellites. These receiver sets are used by DoD. RDT&E funds UE development, integration, test, and analysis for new PNT receiver capabilities in Navigation Warfare (NAVWAR) across all military platforms using GPS services. The MGUE Increment 1 program is responsible for the development of standard modernized receiver form factors for the service-nominated lead platforms identified in the MGUE Capability Development Document (CDD), approved by the Joint Requirements Oversight Council(JROC) on 24 Jul 2014. This new family of modernized GPS receivers will deliver significantly improved capability to counter current and emerging PNT threats and enable military operations in a NAVWAR environment where current legacy receiver performance would be compromised. MGUE Increment 1 received a Milestone A decision in April 2012 and is in the Technology Development acquisition phase. The program received direction in February 2014 from the Under Secretary of Defense for Acquisition, Technology, and Logistics to execute a new acquisition strategy, accelerating the program to provide units faster for military end users. The MGUE program is seeking a tailored Milestone B/C decision in FY16. The MGUE Increment 2 effort is planned to begin in FY17 and will continue to employ M-Code receiver technology into additional applications to meet service requirements. This effort builds on the MGUE Increment 1 technology bringing improved capability to meet applications beyond the four lead platforms. This program is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment. Funding for this exhibit contained in PE 0305164F. The FY2016 funding request was reduced by \$0.078 million to account for the availability of prior execution balances.												

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Appropriation/Budget Activity		R-1 Program Element (Number/Name)				
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B. Program Change Summary (\$ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	
Previous President's Budget	127.172	156.659	152.011	-	152.011	
Current President's Budget	123.081	156.221	142.288	-	142.288	
Total Adjustments	-4.091	-0.438	-9.723	-	-9.723	
• Congressional General Reductions	-	-0.438				
• Congressional Directed Reductions	-	-				
• Congressional Rescissions	-	-				
• Congressional Adds	-	-				
• Congressional Directed Transfers	-	-				
• Reprogrammings	-	-				
• SBIR/STTR Transfer	-4.083	-				
• Other Adjustments	-0.008	-	-9.723	-	-9.723	
Change Summary Explanation						
FY14: -\$4.083 for SBIR/STTR Transfer						
FY16: -\$9.723M to reduce MGUE Alt Acq Strat as estimated by OSD CAPE						
FY16: funding request was reduced by \$0.078 million to account for the availability of prior execution balances.						
C. Accomplishments/Planned Programs (\$ in Millions)				FY 2014	FY 2015	FY 2016
Title: MGUE Increment 1 Technology Development				78.080	119.142	68.744
Description: The MGUE Increment 1 program will develop standard modernized receiver form factors for the service-nominated lead platforms identified in the MGUE CDD.						
FY 2014 Accomplishments:						
Executed MGUE Increment 1 Technology Development phase. Reviewed contractor submitted documents with Systems Engineering and Integration (SE&I) team for technical accuracy, completeness and compliance with contractual agreements. Completed 3 System Design Reviews (SDR) and 3 Preliminary Design Reviews (PDRs). Drafted and implemented new Acquisition Strategy to accelerate M-Code capable units to the warfighter. Completed Technology Readiness Assessment (TRA) with all critical Technology Elements rated at Technology Readiness Level (TRL) 6 or higher.						
FY 2015 Plans:						
Complete MGUE Increment 1 Technology Development phase. Complete development of software and provide initial hardware prototypes. Implement advanced cryptography and electronic warfare defense for two form factors (aviation/maritime and ground).						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2014	FY 2015	FY 2016
Participate in operational demonstrations, pilot initial manufacturing process, assess component reliability, and begin security certifying M-Code capable receivers for sale to military customers. FY 2016 Plans: Complete MGUE combined Milestone B/C. Begin reliability testing on security and compatibility certified M-Code receivers. Assist each lead platform office to acquire, integrate, and test MGUE on the respective platform. Begin security and compatibility certifying receiver cards to develop industrial base and a competitive environment for M-Code receivers.				
Title: MGUE Demonstrations Description: The MGUE program will demonstrate the ability to insert M-Code capability into various platforms. These platforms are in addition to the service lead platforms. FY 2014 Accomplishments: Began integrating M-Code receivers onto US Army Precision Guided Munitions (PGM). Developed interface control documents and plans for testing PGM receivers in a test bed environment before launch. FY 2015 Plans: N/A FY 2016 Plans: N/A		15.000	-	-
Title: Advanced Technology Description: Advanced Technology includes efforts to mature technology for future GPS receivers called out in the MGUE CDD. Look for opportunities to increase resiliency in GPS performance and improve on size, weight, power, and cost of military receivers. FY 2014 Accomplishments: Researched new technologies to augment military GPS capabilities and explored alternate sources of position, navigation, and timing for the warfighter. Developed critical applications to boost current fielded capabilities such as the Small Antenna System (SAS) that enables close air support of helicopters with greater protection against enemy jamming threats. Coordinated interoperability of Electronic Attack (EA) capabilities with other navigation warfare disciplines. Upgraded designs and technologies for chip scale atomic clocks and software based radios. Researched alternate ways to protect GPS cryptography and electronic information against enemy threats. FY 2015 Plans:		6.200	6.100	4.800

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2014	FY 2015	FY 2016
Continue researching new technologies to augment military GPS capabilities and exploring alternate sources of position, navigation, and timing for the warfighter. Invest in key technologies for advanced receivers to include modernized GPS simulators and clocks, advanced antennas, programmable receivers and software based receivers as part of targeted risk reduction efforts. FY 2016 Plans: Continue researching new technologies to augment military GPS and also explore alternate sources of position, navigation, and timing for the warfighter. Continue investing in key technologies for advanced receivers to include modernized GPS simulators and clocks, advanced antennas, programmable receivers and software based receivers as part of targeted risk reduction efforts.				
Title: System/Platform Integration and Performance Certification Description: Technical and operational modernization impact analysis for MGUE Service lead platform integration. Development of DoD Policy, Strategy & Resource Requirements for MGUE Compatibility Certification. Compatibility Certification ensures future military GPS receivers continue working in all environments and concepts of operations called for by US Strategic Command. FY 2014 Accomplishments: Established communications with lead program offices for execution of new MGUE receivers and coordinated cost, schedule, and performance issues relevant to the integration process. Conducted external navigation warfare testing in support of Service lead platform integration. Supported Army migration from handheld to embedded GPS in a variety of platforms. Assisted in current integration of GPS receivers for joint service platforms. FY 2015 Plans: Continue Lead platform integration efforts. Begin prototype integration and testing of the aviation form factor into a GPS receiver box. Prepare to integrate M-Code ground receiver card into Air Force. Army, Navy, and Marine Corps nominated lead platforms. Begin initial integration efforts and plan for testing, to include starting developmental testing. Continue to assist in integration of Legacy current GPS receivers for joint service platforms. Update Interface Control Documents to account for modernized capabilities. FY 2016 Plans: Continue Lead platform integration efforts. Fly prototype receiver unit including the aviation form factor in a live flight test. Continue developmental testing and begin operational testing of the platform including the M-Code GPS receiver unit. Integrate and test M-code receiver cards in Air Force, Army, Navy, and Marine Corps nominated lead platforms. Continue to assist in integration of current GPS receivers for joint service platforms.		9.943	17.179	54.938
Title: Information Assurance and Test/Evaluation Description: Develop, implement and maintain GPS Security Certification programs.		13.858	13.800	13.806

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C. Accomplishments/Planned Programs (\$ in Millions)										FY 2014	FY 2015	FY 2016
FY 2014 Accomplishments: Conducted Modernized Security Evaluations/Tests for Selective Availability Anti-Spoofing Module (SAASM) receivers and other legacy GPS receiver equipment. Achieved lower security handling for M-Code capable receiver cards. Reviewed, approved and tracked integrated platforms using the military GPS signal for every military user. Continued pilot program with Modernized User Equipment (MUE) and developed requirements to security approve MUE and MGUE receivers. Developed process to security approve MGUE receivers.												
FY 2015 Plans: Continue Modernized Security Evaluations/Tests for SAASM and other legacy GPS receiver equipment. Continue to review, approve, and track SAASM/legacy receiver certified platforms and integrated applications for all of the Department of Defense. Accomplish validation and verification required for security certification of MGUE designs. Continue MGUE security activities to include security approval for other than lead platforms, such as munitions, ground monitoring stations, and potentially handhelds. Continue to enforce policy and other requirements related to receiver compatibility accreditation with the GPS signal in space.												
FY 2016 Plans: Continue Modernized Security Evaluations/Tests for SAASM and other legacy GPS receiver equipment. Review, approve, and track SAASM/legacy receiver certified platforms and integrated applications for all of OSD. Continue MGUE security planning activities to include security approval for other than lead platforms, such as munitions and potentially handhelds. Continue to enforce policy and other requirements related to receiver compatibility accreditation with the GPS signal in space. Update Security Certification for any changes coming from Operational Test of MGUE.												
Accomplishments/Planned Programs Subtotals										123.081	156.221	142.288
D. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost	
• P-46: 836730/ Navstar GPS Space	2.053	2.065	2.029	-	2.029	2.187	2.209	2.216	2.255	-	15.014	
Remarks												
E. Acquisition Strategy												
The MGUE program has developed a comprehensive acquisition strategy to provide modernized GPS capabilities to US and Allied forces by developing a commercial market driven approach. This strategy establishes the signal compatibility and security criteria along with a process for evaluating components to enable rapid movement from development to fielding . The pillars of this effort are: (a) establishing time certain and low risk development; (b) bounding requirements to leverage mature technology to the maximum extent possible; (c) focusing on the development of form factors based on well-defined standards to support lead platform integration; and (d) implementing a proactive, collaborative MGUE platform integration activity to mitigate risk and reduce cost for Enterprise modernization.												

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The MGUE program awarded three sole source contracts for the Increment 1 Technology Development Phase effort in September 2012, as follow-on efforts to the competitively awarded Modernized User Equipment (MUE) contracts awarded in June 2006. The effort spans the Technology Development Phase through design and includes Developmental and Operational testing of Service nominated Lead Platforms. This effort also includes the security and compatibility certification of GPS Receiver cards as a part of the Integration effort. The Service Lead Platforms will select from the available vendors to integrate and perform operational testing with funding from the MGUE program. This supports compliance with Public Law 111-383, section 913. MGUE Increment 2 is in the Materiel Solutions Analysis phase. F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Air Force												Date: February 2015			
Appropriation/Budget Activity 3600 / 4						R-1 Program Element (Number/Name) PE 0305164F / NAVSTAR Global Positioning System (User Equipment) (SPACE)				Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP					
Product Development (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Increment 1 Technology Development (Rockwell)	C/CPIF	Rockwell Collins : Cedar Rapids, IA	12.555	21.760	Nov 2013	42.000	Nov 2014	19.394	Jan 2016	-		19.394	30.995	126.704	-
MGUE Increment 1 Technology Development (Raytheon)	C/CPIF	Raytheon : El Segundo, CA	11.530	20.127	Dec 2013	40.408	Nov 2014	19.000	Jan 2016	-		19.000	30.995	122.060	-
MGUE Increment 1 Technology Development (L3)	C/CPIF	L3 : Anaheim, CA	15.545	16.905	Dec 2013	16.062	Nov 2014	9.917	Jan 2016	-		9.917	13.745	72.174	-
MGUE Increment 1 Pre- Tech Development	C/CPAF	Various : Various,	1.588	6.200	Feb 2014	6.100	Jan 2015	4.800	Jan 2016	-		4.800	26.600	45.288	-
MGUE Increment 1 MGUE Demonstrations	C/CPFF	TBD : TBD,	0.000	15.000	Jun 2014	-	Jun 2015	-		-		-	8.500	23.500	-
MGUE Increment 1 Platform Integration	C/CPAF	Various : Various,	1.749	2.904	Jan 2014	9.200	Jan 2015	32.333	Jan 2016	-		32.333	112.053	158.239	-
MGUE Increment 1 Compatibility Certification	C/CPAF	Various : Various,	0.876	2.172	Jan 2014	2.500	Jan 2015	2.500	Jan 2016	-		2.500	16.100	24.148	-
MGUE Increment 1 Information Assurance	C/CPAF	Various : Various,	2.139	2.991	Jan 2014	4.987	Jan 2015	4.986	Jan 2016	-		4.986	31.070	46.173	-
MGUE Increment 1 Enterprise Studies	C/CPAF	Various : El Segundo, CA	4.036	4.867	Nov 2013	5.479	Nov 2014	5.305	Nov 2015	-		5.305	30.603	50.290	-
MGUE Increment 1 Security Certification	C/CPAF	Various : Various,	3.895	6.910	Jan 2014	4.700	Jan 2015	4.900	Jan 2016	-		4.900	26.500	46.905	-
MGUE Increment 1 Reliability Testing	C/CPFF	Various : Various,	0.000	-		-		14.800	Jan 2016	-		14.800	-	14.800	-
Subtotal			53.913	99.836		131.436		117.935		-		117.935	327.161	730.281	-

UNCLASSIFIED

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Support (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Subtotal			-	-		-		-		-		-	-	-	-
Test and Evaluation (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Increment 1 Test and Evaluation (1)	C/CPAF	SPAWAR : San Diego, CA	0.000	1.472	Jan 2014	2.113	Jan 2015	1.920	Jan 2016	-		1.920	4.288	9.793	-
MGUE Increment 1 Test and Evaluation (2)	Various	Various : Various,	0.350	2.486	Jan 2014	2.000	Jan 2015	2.000	Jan 2016	-		2.000	9.000	15.836	-
Subtotal			0.350	3.958		4.113		3.920		-		3.920	13.288	25.629	-
Management Services (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Increment 1 FFRDC 1	Various	Aerospace : El Segundo, CA	3.600	11.105	Dec 2013	10.000	Dec 2014	10.000	Dec 2015	-		10.000	61.020	95.725	-
MGUE Increment 1 FFRDC 2	Various	MITRE : El Segundo, CA	3.828	1.622	Dec 2013	1.229	Dec 2014	1.457	Dec 2015	-		1.457	12.250	20.386	-
MGUE Increment 1 Program Management Administration (PMA)	Various	Various : Various,	1.996	6.560	Dec 2013	9.443	Dec 2014	8.976	Dec 2015	-		8.976	34.386	61.361	-
Subtotal			9.424	19.287		20.672		20.433		-		20.433	107.656	177.472	-
			Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			63.687	123.081		156.221		142.288		-		142.288	448.105	933.382	-
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2016 Air Force			Date: February 2015		
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	FY 2014				FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020			
	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
Preliminary Design Review (PDR)				■																								
Security Risk Reduction					■																							
Security Certification												■																
Milestone B/C												■																
Compatibility Certification													■															
Lead Platforms Operational Test Complete																												
MGUE Increment 2 applications of M-Code receivers																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2016 Air Force			Date: February 2015
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0305164F / NAVSTAR Global Positioning System (User Equipment) (SPACE)	Project (Number/Name) 643833 / MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Preliminary Design Review (PDR)	4	2014	4	2014
Security Risk Reduction	1	2015	1	2015
Security Certification	4	2015	4	2015
Milestone B/C	4	2015	1	2016
Compatibility Certification	3	2016	3	2016
Lead Platforms Operational Test Complete	4	2017	1	2018
MGUE Increment 2 applications of M-Code receivers	1	2017	4	2020