Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*					R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	3.093	3.486	1.549	-	1.549	5.264	5.911	6.307	6.053	Continuing	Continuing
E10: *SENTINEL*	-	3.093	3.486	1.549	-	1.549	5.264	5.911	6.307	6.053	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This system is a supporting program of the overall Air and Missile Defense (AMD) architecture and will provide for an incrementally fielded Integrated Air and Missile Defense Fire Control System/capability for the composite Army Air and Missile Defense Brigades. The Improved Sentinel system is used with the Forward Area Air Defense Command and Control (FAAD C2) element and is a key component to the Integrated Air and Missile Defense architecture via the Integrated Air and Missile Defense Battle Command System (IBCS) to provide critical air surveillance of the forward areas.

Improved Sentinel (AN/MPQ-64A1) consists of a radar-based sensor with its prime mover/power, Identification Friend or Foe (IFF), and Forward Area Air Defense (FAAD) Command, Control and Intelligence (C2I) interfaces. The radar is deployed in both an air defense role and a force protection role for Counter-Rocket, Artillery, and Mortar (C-RAM) missions. The sensor is an advanced three-dimensional battlefield X-Band air defense phased-array radar with an instrumented range of 75 km. The Improved Sentinel is capable of operating day or night, in adverse weather conditions, in the battlefield environments of dust, smoke, aerosols and enemy countermeasures. It provides 360-degree azimuth coverage for acquisition tracking. The Improved Sentinel contributes to the digital battlefield by automatically detecting, classifying, identifying and reporting targets (cruise missiles, unmanned aerial vehicles, rotary wing and fixed wing aircraft). Improved Sentinel acquires targets sufficiently forward of the battle area to allow weapons reaction time and engagement at optimum ranges. The Improved Sentinel's integrated IFF reduces the potential for fratricide of US and Coalition aircraft.

The Research and Development funding supports Sentinel modernization/upgrades, hardware/software issue resolution, resolution of obsolescence issues, engineering studies, and cost reduction initiatives. The funding for FY 2012 through FY 2018 development activities addresses the following Sentinel system capability gaps and obsolescence issues identified by the User: 1) Target Detection gap; 2) Target Tracking gap; 3) Net Readiness gap; 4) Electronic Counter Measures (ECM) gap; and 5) Unmanned Aerial Systems (UAS) Defense gap.

Battle Space Improvement addresses the Target Detection gap that currently exists with the Sentinel system. This development effort modifies the radar signal processor algorithms to reduce system processing losses. The modified algorithms will increase target acquisition and tracking range capability by a minimum of 12 percent against the threat set within the instrumented range band. This effort also develops modifications to the radar hardware by adding a common signal processing card to the radar signal processor to provide a common hardware and software processing configuration across the Sentinel radar fleet.

Stop, Stare and Track addresses the Target Tracking gap. This development effort provides direct Fire Control Radar (FCR) support in an integrated air and missile defense architecture. In addition this provides significantly improved Non-Cooperative Target Recognition (NCTR) timeline and performance against all targets. It also

enables rapid classification of cued RAM, as well as very accurate Point of Origin (POO) and Point of Impact (POI), and enables a robust Kill Assessment capability of engaged targets.

Cross Domain Solution (CDS) Network Interface addresses net readiness and system security concerns. This effort develops a CDS interface to isolate the Improved Sentinel from connected networks of lower classification levels.

Electronic Counter Counter Measures (ECCM) addresses the ECM gap. This effort conducts additional testing to verify initial ECCM results and updates the database with more extensive ECCM signatures of evolving threats.

Signal Data Processor (SDP)/North Finding Module (NFM) addresses the Target Detection, Target Tracking, and ECM capability gaps and funds the mitigation of the SDP and NFM obsolescence issues. SDP cards are estimated to go obsolete every four to six years.

Small/Low/Slow (SLS) addresses the Unmanned Aerial Systems (UAS) Defense gap. This effort provides an order of magnitude capability improvement in Sentinel's ability to detect, track and classify new and emerging smaller and more capable UAS at extended ranges in tactically challenging natural and urban clutter environments while maintaining a low false broadcast track rate, and without the use of different specialized Modes that increase chances for operator misapplication (i.e. there will be only one Mode that does all targets).

B. Program Change Summary ($ in Millions)	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	2.885	3.486	1.966	-	1.966
Current President's Budget	3.093	3.486	1.549	-	1.549
Total Adjustments	0.208	0.000	-0.417	-	-0.417
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.208	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	-0.417	-	-0.417

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
E10: *SENTINEL*	-	3.093	3.486	1.549	-	1.549	5.264	5.911	6.307	6.053	Continuing	Continuing
Quantity of RDT&E Articles												

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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The Research and Development funding supports Sentinel modernization/upgrades, hardware/software issue resolution, resolution of obsolescence issues, engineering studies, and cost reduction initiatives. The funding for FY 2012 through FY 2018 development activities addresses the following Sentinel system capability gaps and obsolescence issues identified by the User: 1) Target Detection gap; 2) Target Tracking gap; 3) Net Readiness gap; 4) Electronic Counter Measures (ECM) gap; and 5) Unmanned Aerial Systems (UAS) Defense gap.

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Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
Title: Product Development	2.664	2.553	0.000
Articles:	0	0	
Description: Funding is provided for the following efforts: ***FY 2012 Accomplishments:*** Defined requirements and functionality for battle space improvement and stop, stare and track capability. Developed new software code and/or modified radar signal processor algorithms. Added common signal processing card to radar signal processor. Performed technical assessments, concept studies, cost reduction, risk reduction, threat analysis, and required documentation. ***FY 2013 Plans:*** Integrate firmware, software and hardware. Build prototype subsystems/components for testing. Complete software code coding and modification of the system search and track logic, clutter mapping, and waveforms. Characterize performance, design & replace firmware, software and hardware. Perform technical assessments, concept studies, cost reduction, risk reduction, threat analysis, and required documentation.			
Title: Test & Evaluation	0.172	0.658	1.408
Articles:	0	0	
Description: Funding is provided for the following efforts:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
FY 2012 Accomplishments: Planned, coded and tested new and modified radar algorithms. Conducted verification testing, field test, and prepared logistics products for material release of software upgrade. ***FY 2013 Plans:*** Conduct software qualification test and hardware verification testing, field testing against representative targets. Prepare logistics products and required documentation for material release of software and hardware upgrades. ***FY 2014 Plans:*** Conduct system verification test and system qualification test on software upgrades.			
Title: Management Support ***Articles:*** ***Description:*** This funds Government and technical support. ***FY 2012 Accomplishments:*** Provided government management, technical and administrative support in FY 2012. ***FY 2013 Plans:*** Provides government management, technical and administrative support in FY 2013. ***FY 2014 Plans:*** Provides government management, technical and administrative support in FY 2014.	0.257 0	0.275 0	0.141
Accomplishments/Planned Programs Subtotals	3.093	3.486	1.549

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
• PE 0604869A: *Proj M06, Patriot/ MEADS Combined Aggregate Program (CAP)*	377.610	400.861								0.000	778.471
• PE 0605456A: *Proj PA3, PAC-3/ MSE MISSILE*	86.139	69.029	68.843		68.843	129.627	63.506	65.179	65.734	Continuing	Continuing
• SSN C53101: *MSE Missile*	74.953	12.850	540.401		540.401	540.520	559.623	566.757	655.184	Continuing	Continuing
• PE 0102419A: *Proj E55, JLENS*	317.382	190.422	98.450		98.450	46.600	47.450	37.830	2.600	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
• PE 0605455A: *Proj S35, SLAMRAAM*	1.186									0.000	1.186
• PE 0604319A: *Proj DU3, IFPC2 (FY12 PE0603305A IFPC II - Intercept)*	8.834	76.039	79.232		79.232	107.587	146.463	151.769	159.700	Continuing	Continuing
• PE 0605457A: *Proj S40, Army Integrated Air and Missile Defense (AIAMD)*	262.032	262.211	364.649		364.649	382.869	221.306	141.908	79.338	Continuing	Continuing
• SSN BZ5075: *IAMD Battle Command System*			21.200		21.200	100.700	315.370	482.640	446.130	Continuing	Continuing
• PE 0604820A: *Proj E10, SENTINEL*	3.093	3.486	1.549		1.549	5.264	5.911	6.307	6.053	Continuing	Continuing
• PE 0604741A: *Proj 126, 146, 149; Air Defense C2I Eng Dev*	57.050	73.333	18.294		18.294	20.898	20.557	18.009	11.015	Continuing	Continuing

Remarks

This program is an integral part of the Army Integrated Air and Missile Defense (IAMD) architecture.

D. Acquisition Strategy

Battle Space Improvement: The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to update and modify the radar signal processor algorithms. The updated software will be tested, documented and released for installation.

Stop, Stare and Track: The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to develop new and/or modify existing Sentinel software. The updated software will be tested, documented and released for installation.

Cross Domain Solution Interface: The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to develop an interface solution to isolate Improved Sentinel transmission from connected networks of lower classifications. The updated software will be tested, documented and released for installation in the field.

Electronic Counter Counter Measures (ECCM): The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to verify the initial ECCM Database and update the database with more extensive ECCM signatures of evolving threats. The updated database will be tested, documented and released for installation.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*

Signal Data Processor (SDP)/North Finding Module (NFM)Obsolescence: The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to upgrade and mitigate the Signal Data Processor and North Finding Module issues. The updated SDP and NFM hardware will be tested, documented and released for installation in the field.

Small/Low/Slow (SLS): The Sentinel Product Office will contract with Thales Raytheon Systems (TRS) to develop new and/or modify existing Sentinel software in order to improve Sentinel's ability to detect, track and classify new and emerging smaller and more capable Unmanned Aerial Systems (UAS) at extended ranges in tactically challenging natural and urban clutter environments. The updated software will be tested, documented and released for installation in the field.

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Sentinel Development	SS/CPFF	Thales Raytheon Systems & Government:Fullerton, CA / Huntsville, AL	11.398	-		-		-		-		-	Continuing	Continuing	0.000
System of Systems Mod Development & Integration	SS/CPFF	Thales Raytheon Systems & Government:Fullerton ,CA / Huntsville, AL	1.169	-		-		-		-		-	Continuing	Continuing	0.000
Battle Space Improvement	SS/CPFF	Thales Raytheon Systems & Government:Fullerton, CA / Huntsville, AL	0.000	0.139		0.088		0.049		-		0.049	0.000	0.276	0.000
Stop, Stare and Track	SS/CPFF	Thales Raytheon Systems & Government:Fullerton, CA / Huntsville, AL	0.000	0.118		0.187		0.091		-		0.091	0.000	0.396	0.000
		Subtotal	12.567	0.257		0.275		0.140		0.000		0.140			0.000

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Sentinel Development	SS/CPFF	Thales Raytheon Systems:Fullerton, CA	102.729	-		-		-		-		-	Continuing	Continuing	0.000
System of Systems Mod Development & Integration	SS/CPFF	Thales Raytheon Systems:Fullerton, CA	20.820	-		-		-		-		-	Continuing	Continuing	0.000
Battle Space Improvement	SS/CPFF	Thales Raytheon Systems & Government:Fullerton, CA / Huntsville, AL	0.000	1.463	May 2012	0.827		-		-		-	0.000	2.290	0.000
Stop, Stare, and Track	SS/CPFF	Thales Raytheon Systems &	0.000	1.201	May 2012	1.726		-		-		-	0.000	2.927	0.000

Exhibit R-3, RDT&E Project Cost Analysis: PB 2014 Army			DATE: April 2013
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Government:Fullerton, CA / Huntsville, AL													
		Subtotal	123.549	2.664		2.553		0.000		0.000		0.000			0.000

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Sentinel Development	SS/CPFF	Thales Raytheon Systems:Fullerton, CA	16.930	-		-		-		-		-	Continuing	Continuing	0.000
System of Systems Mod Development & Integration	SS/CPFF	Thales Raytheon Systems:Fullerton, CA	0.352	-		-		-		-		-	Continuing	Continuing	0.000
		Subtotal	17.282	0.000		0.000		0.000		0.000		0.000			0.000

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Improved Sentinel Mod Development	SS/CPFF	Thales Raytheon Systems:Fullerton CA	34.599	-		-		-		-		-	Continuing	Continuing	0.000
System of Systems Mod Development & Integration	SS/CPFF	Thales Raytheon Systems:Fullerton, CA	2.331	-		-		-		-		-	Continuing	Continuing	0.000
Battle Space Improvement	SS/CPFF	Thales Raytheon Systems & Government:Fullerton, CA / Huntsville, AL	0.000	0.086		0.086		0.447		-		0.447	0.000	0.619	0.000
Stop, Stare and Track	SS/CPFF	Thales Raytheon Systems &	0.000	0.086		0.572		0.962		-		0.962	0.000	1.620	0.000

Exhibit R-3, RDT&E Project Cost Analysis: PB 2014 Army			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Government:Fullerton, CA / Huntsville, AL													
		Subtotal	36.930	0.172		0.658		1.409		0.000		1.409			0.000

	All Prior Years	FY 2012		FY 2013		FY 2014 Base		FY 2014 OCO		FY 2014 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	190.328	3.093		3.486		1.549		0.000		1.549			0.000

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	R-1 ITEM NOMENCLATURE PE 0604820A: *RADAR DEVELOPMENT*	PROJECT E10: *SENTINEL*

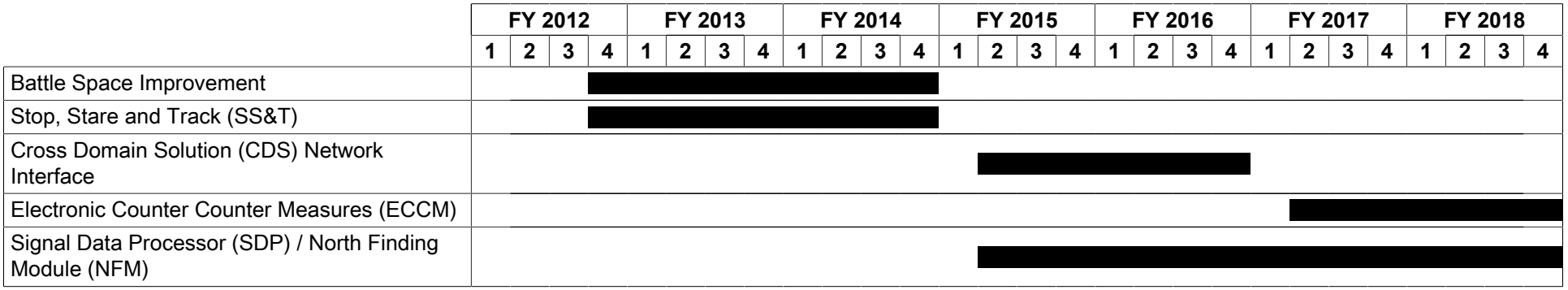

Exhibit R-4A, RDT&E Schedule Details: PB 2014 Army		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 5: *System Development & Demonstration (SDD)*	**R-1 ITEM NOMENCLATURE** PE 0604820A: *RADAR DEVELOPMENT*	**PROJECT** E10: *SENTINEL*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Battle Space Improvement	4	2012	4	2014
Stop, Stare and Track (SS&T)	4	2012	4	2014
Cross Domain Solution (CDS) Network Interface	2	2015	4	2016
Electronic Counter Counter Measures (ECCM)	2	2017	4	2018
Signal Data Processor (SDP) / North Finding Module (NFM)	2	2015	4	2018