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RCS: DD-A&T(Q&A)823-438



## **Space Fence Ground-Based Radar System Increment 1 (Space Fence Inc 1)**

As of FY 2021 President's Budget

Defense Acquisition Management  
Information Retrieval  
(DAMIR)

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## Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance  
ACAT - Acquisition Category  
ADM - Acquisition Decision Memorandum  
APB - Acquisition Program Baseline  
APPN - Appropriation  
APUC - Average Procurement Unit Cost  
\$B - Billions of Dollars  
BA - Budget Authority/Budget Activity  
Blk - Block  
BY - Base Year  
CAPE - Cost Assessment and Program Evaluation  
CARD - Cost Analysis Requirements Description  
CDD - Capability Development Document  
CLIN - Contract Line Item Number  
CPD - Capability Production Document  
CY - Calendar Year  
DAB - Defense Acquisition Board  
DAE - Defense Acquisition Executive  
DAMIR - Defense Acquisition Management Information Retrieval  
DoD - Department of Defense  
DSN - Defense Switched Network  
EMD - Engineering and Manufacturing Development  
EVM - Earned Value Management  
FOC - Full Operational Capability  
FMS - Foreign Military Sales  
FRP - Full Rate Production  
FY - Fiscal Year  
FYDP - Future Years Defense Program  
ICE - Independent Cost Estimate  
IOC - Initial Operational Capability  
Inc - Increment  
JROC - Joint Requirements Oversight Council  
\$K - Thousands of Dollars  
KPP - Key Performance Parameter  
LRIP - Low Rate Initial Production  
\$M - Millions of Dollars  
MDA - Milestone Decision Authority  
MDAP - Major Defense Acquisition Program  
MILCON - Military Construction  
N/A - Not Applicable  
O&M - Operations and Maintenance  
ORD - Operational Requirements Document  
OSD - Office of the Secretary of Defense  
O&S - Operating and Support  
PAUC - Program Acquisition Unit Cost

PB - President's Budget  
PE - Program Element  
PEO - Program Executive Officer  
PM - Program Manager  
POE - Program Office Estimate  
RDT&E - Research, Development, Test, and Evaluation  
SAR - Selected Acquisition Report  
SCP - Service Cost Position  
TBD - To Be Determined  
TY - Then Year  
UCR - Unit Cost Reporting  
U.S. - United States  
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)  
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

## Program Information

**Program Name**

Space Fence Ground-Based Radar System Increment 1 (Space Fence Inc 1)

**DoD Component**

Air Force

This is a United States Space Force program.

## Responsible Office

Ms. Elaine Doyle  
11 Barksdale Street Bldg 1614  
Hanscom Air Force Base, MA 01731

[elaine.doyle@us.af.mil](mailto:elaine.doyle@us.af.mil)

**Phone:** 781-225-9673  
**Fax:** 781-225-0318  
**DSN Phone:** 845-9673  
**DSN Fax:**  
**Date Assigned:** April 2, 2017

## References

**SAR Baseline (Development Estimate)**

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated June 18, 2014

**Approved APB**

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated June 18, 2014

## Mission and Description

The Space Fence Ground-Based Radar System (Space Fence) replaces the mission of the Air Force Space Surveillance System Very High Frequency "fence" radar that performed detection of orbiting space objects before decommissioning in FY 2013. The Space Fence mission is to improve Space Situational Awareness by fielding a capability to detect and report small objects in Low Earth Orbit/Medium Earth Orbit (LEO/MEO). The system, comprising one operations center and two radar sites operating at S-band frequencies, will have a modern, net-centric architecture. Fielded capabilities will include uncued capability to find, fix and track small objects in LEO/MEO; improved completeness and accuracy of the space catalog; improved timeliness of orbital event information; and support for improved characterization of space objects.

The Space Fence Increment 1 (Inc 1) includes the operations center, located at the Reagan Test Site Operations Center Huntsville, Alabama, and one radar site, located at Kwajalein Atoll, Republic of the Marshall Islands.

## Executive Summary

### Program Highlights Since Last Report

This is the final SAR submission for the Space Fence Inc 1 program. Pursuant to section 2432 of Title 10, United States Code, this is the final SAR submission for the Space Fence Inc 1 program, because the program is 90% or more expended.

Resolution of system stability and radar performance issues extended the contractor test period and slipped the Government test schedule. On March 18, 2019, the Program Office forecasted and declared an APB schedule breach for the Initial Operational Test and Evaluation (IOT&E) start milestone. A PDR was submitted in March 2019 and acknowledged by the MDA. The program determined that this delay would not impact the final program milestone.

On April 1, 2019, the Development Test Readiness Review authorized entry into the Development Test and Evaluation (DT&E) phase.

On May 22, 2019, Air Force Space Command granted the Space Fence program a two-year Authority to Operate.

On June 7, 2019, the program completed a maintainability demonstration.

On July 17, 2019, the Operational Test Readiness Review was held. The Air Force PEO for Space certified Space Fence readiness for IOT&E and the Air Force Operational Test and Evaluation Center Detachment 4 Commander issued an Acknowledgment Memo on July 22, 2019.

On July 26, 2019, DT&E regression testing concluded. Following a final Deficiency Review Board on August 6, 2019, IOT&E was initiated the same day. IOT&E concluded November 7, 2019.

Air Force Space Command conducted a Trial Period Review Panel on November 21, 2019, authorizing entry into a sixty-day trial period on November 25, 2019.

On December 23, 2019, the program achieved its final APB milestone, Required Assets Available.

There are no significant software-related issues with this program at this time.

History of Significant Developments Since Program Initiation	
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History of Significant Developments Since Program Initiation	
Date	Significant Development Description
May 2013	Milestone B DAB conducted May 29, 2013.
May 2014	Milestone B ADM signed May 30, 2014 following delay due to Sequestration.
June 2014	Prime contract awarded to Lockheed Martin.
June 2014	APB signed June 18, 2014.
September 2015	ADM delegates MDA to the Service Acquisition Executive, redesignating the program as ACAT IC.
April 2019	Authorized to initiate Development Test and Evaluation April 1, 2019.
August 2019	Initial Operational Test and Evaluation commenced August 6, 2019.
November 2019	Operational Test completed November 7, 2019
November 2019	Space Fence Trial Period commenced November 25, 2019.
December 2019	Required Assets Available attained for Space Fence Increment 1 on December 23, 2019



## Threshold Breaches

### APB Breaches

<b>Schedule</b>		<input checked="" type="checkbox"/>
<b>Performance</b>		<input type="checkbox"/>
<b>Cost</b>	RDT&E	<input type="checkbox"/>
	Procurement	<input type="checkbox"/>
	MILCON	<input type="checkbox"/>
	Acq O&M	<input type="checkbox"/>
<b>O&amp;S Cost</b>		<input type="checkbox"/>
<b>Unit Cost</b>	PAUC	<input type="checkbox"/>
	APUC	<input type="checkbox"/>

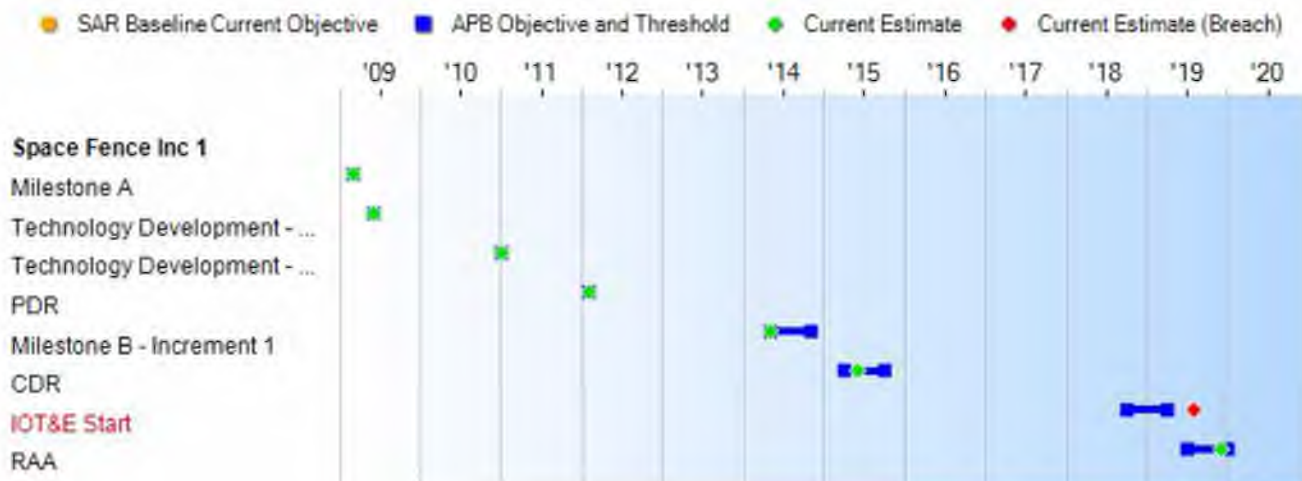
### Explanation of Breach

On March 18, 2019, the Space Fence Office Program Manager declared an APB schedule breach to the Initial Operational Test and Evaluation (IOT&E) start milestone. This was due to system stability and radar performance issues that extended the contractor's test period and slipped the Government test schedule. IOT&E actually started on August 6, 2019, and the final APB milestone of RAA was achieved on December 23, 2019. Therefore, no APB update was required.

### Nunn-McCurdy Breaches

<b>Current UCR Baseline</b>		
	PAUC	None
	APUC	None
<b>Original UCR Baseline</b>		
	PAUC	None
	APUC	None

### Schedule



Schedule Events				
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate
Milestone A	Mar 2009	Mar 2009	Mar 2009	Mar 2009
Technology Development - Phase A - SDR Contract Award	Jun 2009	Jun 2009	Jun 2009	Jun 2009
Technology Development - Phase A - PDR Contract Award	Jan 2011	Jan 2011	Jan 2011	Jan 2011
PDR	Feb 2012	Feb 2012	Feb 2012	Feb 2012
Milestone B - Increment 1	May 2014	May 2014	Nov 2014	May 2014
CDR	Apr 2015	Apr 2015	Oct 2015	Jun 2015
IOT&E Start	Oct 2018	Oct 2018	Apr 2019	<b>Aug 2019<sup>1</sup></b> (Ch-1)
RAA	Jul 2019	Jul 2019	Jan 2020	Dec 2019 (Ch-2)

<sup>1</sup> APB Breach

#### Change Explanations

- (Ch-1) The current estimate for IOT&E Start changed from April 2019 to August 2019 to reflect the actual date.
- (Ch-2) The current estimate for RAA changed from August 2019 to December 2019 to reflect actual RAA achievement.

**Notes**

RAA is defined as the date when the Program Manager has provided sufficient equipment and logistics resources to support IOC determination. The RAA objective date assumes the EMD contract award in June 2014, and consists of:

- DD250 of at least one radar sensor and SOC
- Ensuring communications links and connectivity to the Global Information Grid are in compliance with then-existing Net-Centric Enterprise Services standards, guidance and direction
- Initial spares for one radar sensor and SOC
- Common and peculiar support equipment
- Interim contractor support established
- Stand-alone training systems and resources at Initial Qualification Training and Upgrade Qualification Training locations

For this SAR, RAA is being used as a surrogate for IOC.

**Acronyms and Abbreviations**

CDR - Critical Design Review  
IOT&E - Initial Operational Test & Evaluation  
PDR - Preliminary Design Review  
RAA - Required Assets Available  
SDR - System Design Review  
SOC - Space Fence Operations Center

## Performance

Performance Characteristics			
SAR Baseline Development Estimate	Current APB Development Objective/Threshold	Demonstrated Performance	Current Estimate
<b>System Training</b>			
Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course(s) shall be tailored to meet the learning objectives of each duty position using the most	Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course(s) shall be tailored to meet the learning objectives of each	(Threshold = Objective) Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course(s) shall be tailored to	TBD
			Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course(s) shall be tailored to meet the learning objectives of each

cost-efficient training media, as determined by the AF ISD process. For CMR operations training and evaluation: The Space Fence shall deliver off-line training simulation capability with fidelity that emulates typical operations, which shall: Be physically and electronically separated from the operational system. Have software application(s) which utilize and integrate with the government-furnished SST software. Look, sound and feel like the actual operational equipment to support required proficiency levels. Be capable of being upgraded as operational functionality is upgraded. The Space Fence shall deliver the associated COTS-based hardware to applicable AFSPC and AETC units (TBD), that will: Fulfill the hardware compatibility requirements of the SST software. Fulfill the security accreditation requirements of the training simulation software. The Space Fence shall collaborate with the SST software vendor to integrate the simulation software with the COTS-based hardware and the government-furnished SST software. The Space Fence shall provide operations procedures and Type 1

duty position using the most cost-efficient training media, as determined by the AF ISD process. For CMR operations training and evaluation: The Space Fence shall deliver off-line training simulation capability with fidelity that emulates typical operations, which shall: Be physically and electronically separated from the operational system. Have software application(s) which utilize and integrate with the government-furnished SST software. Look, sound and feel like the actual operational equipment to support required proficiency levels. Be capable of being upgraded as operational functionality is upgraded. The Space Fence shall deliver the associated COTS-based hardware to applicable AFSPC and AETC units (TBD), that will: Fulfill the hardware compatibility requirements of the SST software. Fulfill the security accreditation requirements of the training simulation software. The Space Fence shall collaborate with the SST software vendor to integrate the simulation software with the COTS-based

meet the learning objectives of each duty position using the most cost-efficient training media, as determined by the AF ISD process. For CMR operations training and evaluation: The Space Fence shall deliver off-line training simulation capability with fidelity that emulates typical operations, which shall: Be physically and electronically separated from the operational system. Have software application(s) which utilize and integrate with the government-furnished SST software. Look, sound and feel like the actual operational equipment to support required proficiency levels. Be capable of being upgraded as operational functionality is upgraded. The Space Fence shall deliver the associated COTS-based hardware to applicable AFSPC and AETC units (TBD), that will: Fulfill the hardware compatibility requirements of the SST software. Fulfill the security accreditation requirements of the training simulation software. The Space Fence shall collaborate with the SST software vendor to integrate the

duty position using the most cost-efficient training media, as determined by the AF ISD process. For CMR operations training and evaluation: The Space Fence shall deliver off-line training simulation capability with fidelity that emulates typical operations, which shall: Be physically and electronically separated from the operational system. Have software application(s) which utilize and integrate with the government-furnished SST software. Look, sound and feel like the actual operational equipment to support required proficiency levels. Be capable of being upgraded as operational functionality is upgraded. The Space Fence shall deliver the associated COTS-based hardware to applicable AFSPC and AETC units (TBD), that will: Fulfill the hardware compatibility requirements of the SST software. Fulfill the security accreditation requirements of the training simulation software. The Space Fence shall collaborate with the SST software vendor to integrate the simulation software with the COTS-based

<p>training on the use of the integrated SST -based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.</p>	<p>hardware and the government-furnished SST software. The Space Fence shall provide operations procedures and Type 1 training on the use of the integrated SST -based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.</p>	<p>simulation software with the COTS-based hardware and the government-furnished SST software. The Space Fence shall provide operations procedures and Type 1 training on the use of the integrated SST -based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.</p>		<p>hardware and the government-furnished SST software. The Space Fence shall provide operations procedures and Type 1 training on the use of the integrated SST -based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.</p>
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**Net-Ready**

<p>Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally</p>	<p>Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including</p>	<p>Space Fence must fully support execution of joint critical operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including</p>	<p>TBD</p>	<p>Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including</p>
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<p>effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements</p>	<p>specified operationally effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements</p>	<p>specified operationally effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an IATO or ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements</p>		<p>specified operationally effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements</p>
<b>MDT Size</b>				
<p>MDT = 10 cm (cubesat) at orbital altitudes <math>\geq 250</math>km and <math>\leq 2,000</math> km. MDT = 20 cm (cubesat) at orbital altitudes <math>\geq 2,000</math>km and <math>\leq 3,000</math> km</p>	<p>MDT = 10 cm (cubesat) at orbital altitudes <math>\geq 250</math>km and <math>\leq 2,000</math> km. MDT = 20 cm (cubesat) at orbital altitudes <math>\geq 2,000</math>km and <math>\leq 3,000</math> km</p>	<p>(Threshold = Objective) MDT = 10 cm (cubesat) at orbital altitudes <math>\geq 250</math>km and <math>\leq 2,000</math> km. MDT = 20 cm (cubesat) at orbital altitudes <math>\geq 2,000</math>km and <math>\leq 3,000</math> km</p>	TBD	<p>MDT = 10 cm (cubesat) at orbital altitudes <math>\geq 250</math>km and <math>\leq 2,000</math> km. MDT = 20 cm (cubesat) at orbital altitudes <math>\geq 2,000</math>km and <math>\leq 3,000</math> km</p>
<b>Fence Integrity</b>				
$\geq 95\%$ (Cued); $\geq 50\%$	$\geq 95\%$ (Cued); $\geq 50\%$	(Threshold =	TBD	$\geq 95\%$ (Cued); $\geq 50\%$

(Un-cued)	(Un-cued)	Objective) ≥ 95% (Cued); ≥ 50% (Un-cued)		(Un-cued)
<b>Surveillance and Track Coverage</b>				
IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)	IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)	(Threshold = Objective) IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)	TBD	IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)
<b>E3</b>				
All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission degradation, or other interference with normal operations of	All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission	(Threshold = Objective) All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable	TBD	All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission



the Space Fence.	degradation, or other interference with normal operations of the Space Fence.	impacts, mission degradation, or other interference with normal operations of the Space Fence.		degradation, or other interference with normal operations of the Space Fence.
<b>Sustainment Ao</b>				
Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	(Threshold = Objective) Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	TBD	Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%

### Requirements Reference

CDD dated June 11, 2012

### Change Explanations

None

**Acronyms and Abbreviations**

AETC - Air Education and Training Command  
AF - Air Force  
AFI - Air Force Instruction  
AFSPC - Air Force Space Command  
Ao - Operational Availability  
ATO - Authority To Operate  
cm - centimeter  
CMR - Combat Mission Ready  
COTS - Commercial Off The Shelf  
DAA - Designating Accrediting Authority  
DoD IEA - DoD Information Enterprise Architecture  
DoDAF - Department of Defense Architecture Framework  
E3 - Electromagnetic Environmental Effects  
EMI - Electromagnetic Interference  
GESPs - GIG Enterprise Service Profiles  
GIG - Global Information Grid  
IAW - In Accordance With  
IP - Internet Protocol  
ISD - Instructional Systems Design/Development  
IT - Information Technology  
JTRS - Joint Tactical Radio System  
km - Kilometer  
MDT - Minimum Detectable Target  
Ref - Reference  
SAASM - Selective Availability Anti-spoofing Module  
SIMCERT - Simulator Certification  
SOC - Space Operations Center  
SORTS - Status of Resources and Training System  
SST - Standard Space Trainer  
StdV - Standards View  
TO - Technical Order

## Track to Budget

### General Notes

In December 2019, the Office of Management and Budget directed the DoD to establish new Space Force RDT&E and procurement appropriations. Beginning in FY 2021, space-related RDT&E funding, formerly under 3600F (RDT&E, Air Force) is contained in 3620SF (RDT&E, Space Force) and space procurement funding formerly under 3021F (Space Procurement, Air Force) is contained in 3022SF (Procurement, Space Force).

### RDT&E

Appn	BA	PE	
Air Force	3600	05	0604425F
	<b>Project</b>	<b>Name</b>	
	65A009	Space Fence (Sunk)	
Air Force	3600	05	0604426F
	<b>Project</b>	<b>Name</b>	
	65A009	Space Fence (Sunk)	
Air Force	3600	05	1206426F
	<b>Project</b>	<b>Name</b>	
	65A009	Space Fence (Sunk)	

### Notes

Prior to FY 2015 all funds were executed and reported in PE 0604225F (Space Situational Awareness Systems).

## Cost and Funding

### Cost Summary

Total Acquisition Cost							
Appropriation	BY 2014 \$M			BY 2014 \$M	TY \$M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	1567.7	1567.7	1724.5	1437.6	1594.2	1594.2	1446.3
Procurement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flyaway	--	--	--	0.0	--	--	0.0
Recurring	--	--	--	0.0	--	--	0.0
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1567.7	1567.7	N/A	1437.6	1594.2	1594.2	1446.3

#### Current APB Cost Estimate Reference

CAPE ICE dated May 23, 2014

#### Cost Notes

No cost estimate for the program has been completed in the previous year.

Total Quantity			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E		1	1
Procurement		0	0
Total		1	1

## Cost and Funding

### Funding Summary

Appropriation Summary									
FY 2021 President's Budget / December 2019 SAR (TY\$ M)									
Appropriation	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
RDT&E	1446.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1446.3
Procurement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2021 Total	1446.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1446.3
PB 2020 Total	1454.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1454.9
Delta	-8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8.6

#### Funding Notes

Interim Contractor Support is 3021 funded. This period (FY 2019 and FY 2020) is included in the Operations & Sustainment Phase. Therefore, these funds are included in the total Life Cycle Cost, but not included in the Program Acquisition Cost.

Quantity Summary										
FY 2021 President's Budget / December 2019 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
Development	1	0	0	0	0	0	0	0	0	1
Production	0	0	0	0	0	0	0	0	0	0
PB 2021 Total	1	0	0	0	0	0	0	0	0	1
PB 2020 Total	1	0	0	0	0	0	0	0	0	1
Delta	0	0	0	0	0	0	0	0	0	0

## Cost and Funding

### Annual Funding By Appropriation

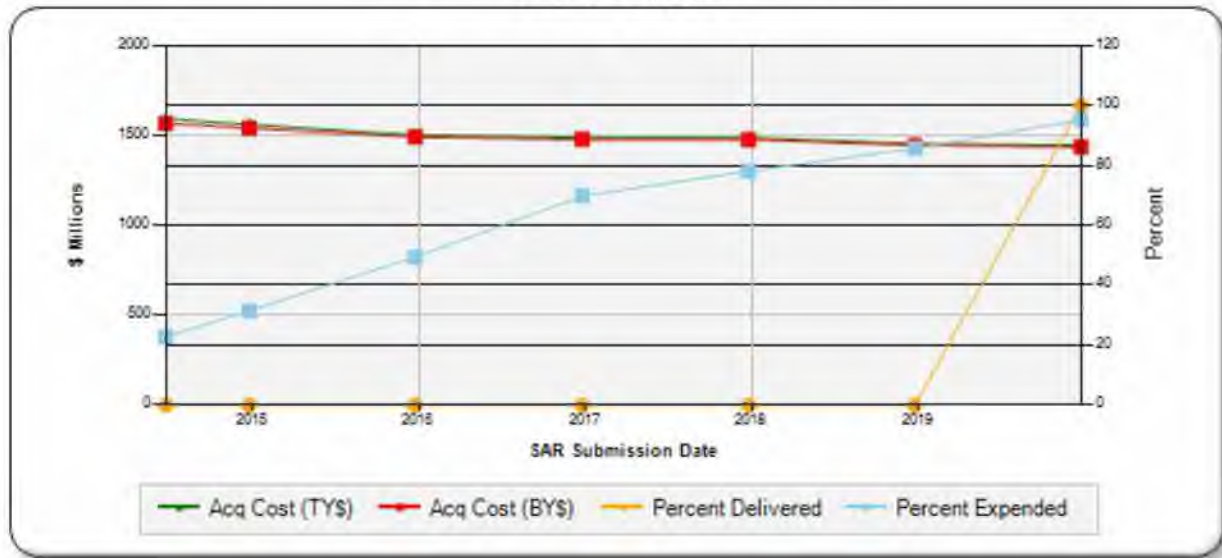
Annual Funding							
3600   RDT&E   Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	5.2
2006	--	--	--	--	--	--	6.6
2007	--	--	--	--	--	--	--
2008	--	--	--	--	--	--	13.8
2009	--	--	--	--	--	--	25.5
2010	--	--	--	--	--	--	62.8
2011	--	--	--	--	--	--	138.4
2012	--	--	--	--	--	--	111.4
2013	--	--	--	--	--	--	203.6
2014	--	--	--	--	--	--	279.3
2015	--	--	--	--	--	--	191.7
2016	--	--	--	--	--	--	230.7
2017	--	--	--	--	--	--	132.5
2018	--	--	--	--	--	--	26.0
2019	--	--	--	--	--	--	18.8
Subtotal	1	--	--	--	--	--	1446.3

Annual Funding							
3600   RDT&E   Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2014 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	6.1
2006	--	--	--	--	--	--	7.5
2007	--	--	--	--	--	--	--
2008	--	--	--	--	--	--	15.0
2009	--	--	--	--	--	--	27.3
2010	--	--	--	--	--	--	66.4
2011	--	--	--	--	--	--	143.7
2012	--	--	--	--	--	--	113.7
2013	--	--	--	--	--	--	204.3
2014	--	--	--	--	--	--	276.4
2015	--	--	--	--	--	--	187.8
2016	--	--	--	--	--	--	222.8
2017	--	--	--	--	--	--	125.4
2018	--	--	--	--	--	--	24.1
2019	--	--	--	--	--	--	17.1
Subtotal	1	--	--	--	--	--	1437.6

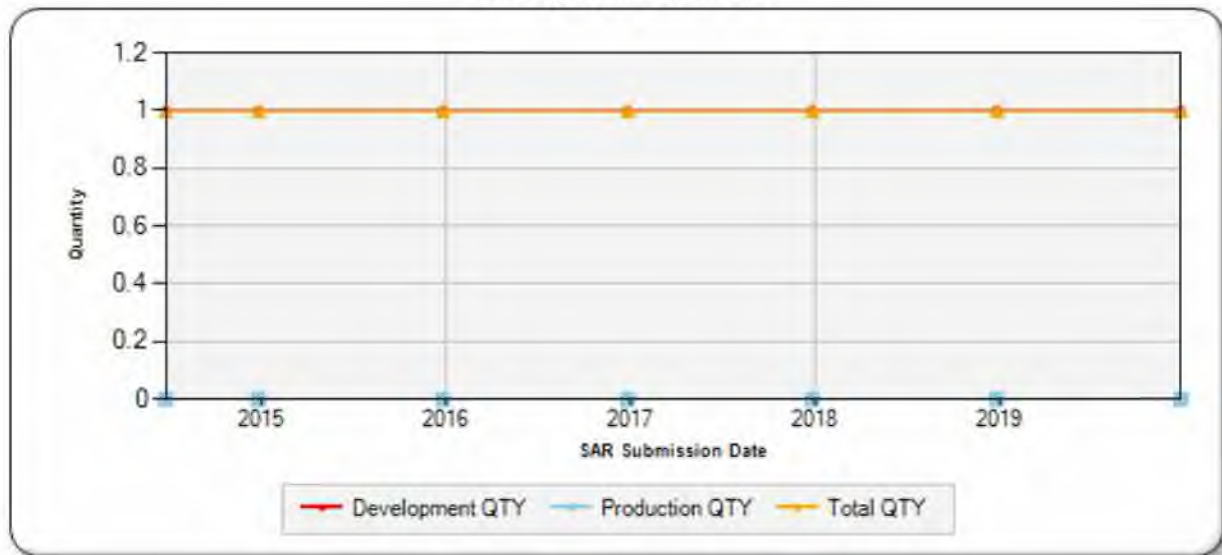
Charts

Space Fence Inc 1 first began SAR reporting in June 2014

Program Acquisition Cost - Space Fence Inc 1  
Base Year 2014 \$M

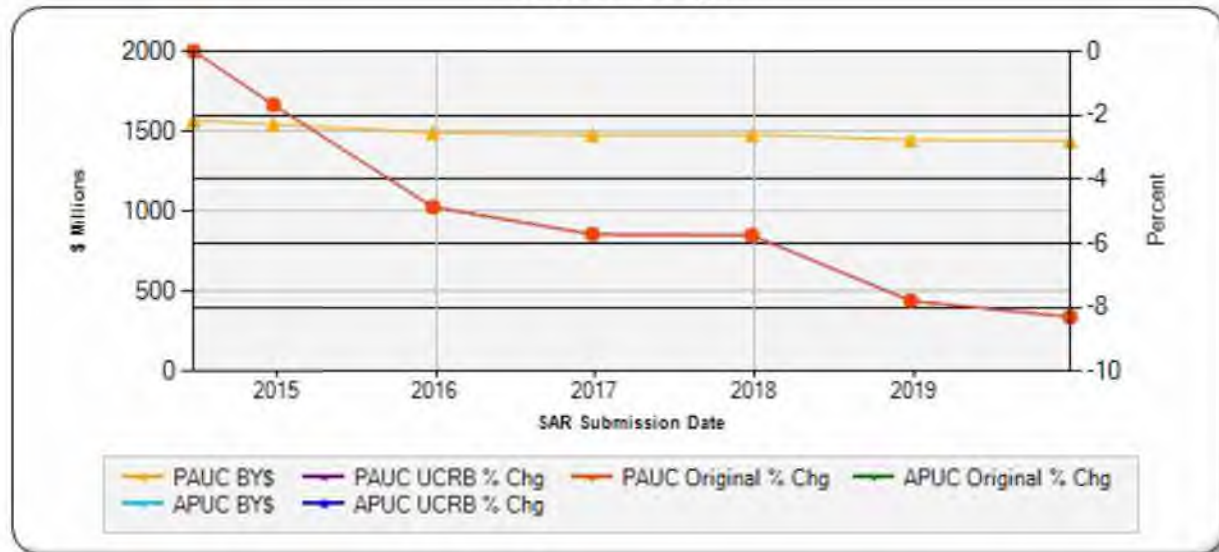


Quantity - Space Fence Inc 1





Unit Cost - Space Fence Inc 1  
Base Year 2014 \$M



## Risks

### Significant Schedule and Technical Risks

Significant Schedule and Technical Risks	
Current Estimate (December 2019)	
1.	System Reliability - RETIRED
2.	Latent Defects - RETIRED
3.	Reduced Array Size Performance - RETIRED

## Risks

### Risk and Sensitivity Analysis

Risks and Sensitivity Analysis	
<b>Current Baseline Estimate (June 2014)</b>	
1.	N/A
<b>Original Baseline Estimate (June 2014)</b>	
1.	N/A
<b>Revised Original Estimate (N/A)</b>	
None	
<b>Current Procurement Cost (December 2019)</b>	
1.	N/A

**Low Rate Initial Production**

There is no LRIP for this program.

## **Foreign Military Sales**

None

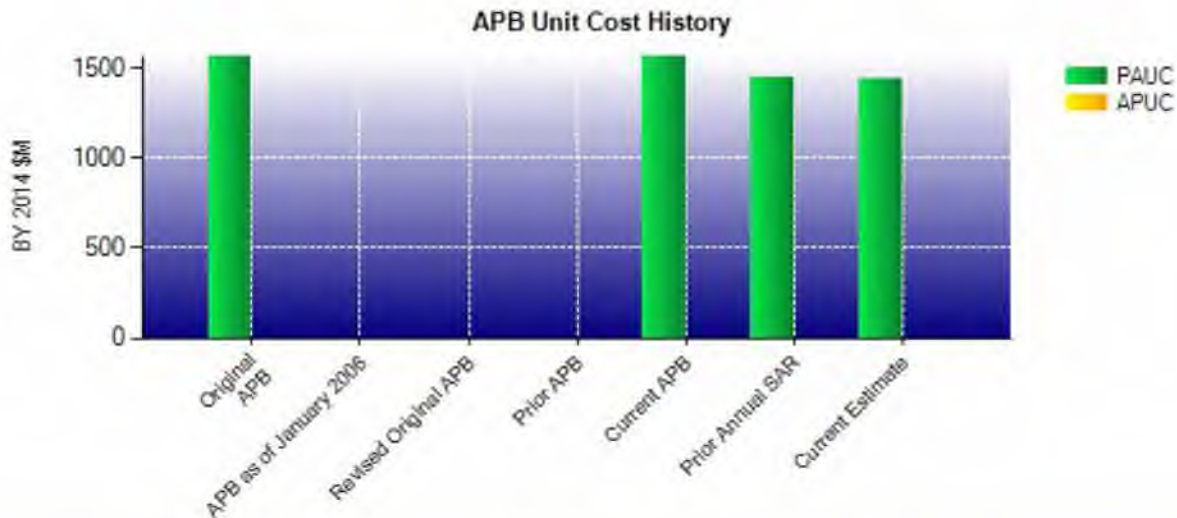
## **Nuclear Costs**

None

**Unit Cost**

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2014 \$M	BY 2014 \$M	% Change
	Current UCR Baseline (Jun 2014 APB)	Current Estimate (Dec 2019 SAR)	
<b>Program Acquisition Unit Cost</b>			
Cost	1567.7	1437.6	
Quantity	1	1	
Unit Cost	1567.700	1437.600	-8.30
<b>Average Procurement Unit Cost</b>			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2014 \$M	BY 2014 \$M	% Change
	Original UCR Baseline (Jun 2014 APB)	Current Estimate (Dec 2019 SAR)	
<b>Program Acquisition Unit Cost</b>			
Cost	1567.7	1437.6	
Quantity	1	1	
Unit Cost	1567.700	1437.600	-8.30
<b>Average Procurement Unit Cost</b>			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--



APB Unit Cost History					
Item	Date	BY 2014 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Jun 2014	1567.700	N/A	1594.200	N/A
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	Jun 2014	1567.700	N/A	1594.200	N/A
Prior Annual SAR	Dec 2018	1445.400	N/A	1454.900	N/A
Current Estimate	Dec 2019	1437.600	N/A	1446.300	N/A

**SAR Unit Cost History**

Current SAR Baseline to Current Estimate (TY \$M)									
PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1594.200	-12.800	0.000	0.000	0.000	-135.100	0.000	0.000	-147.900	1446.300

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

An APUC Unit Cost History is not available, since no Initial APUC Estimate had been calculated due to a lack of defined quantities.

<b>SAR Baseline History</b>				
<b>Item</b>	<b>SAR Planning Estimate</b>	<b>SAR Development Estimate</b>	<b>SAR Production Estimate</b>	<b>Current Estimate</b>
Milestone A	N/A	Jun 2009	N/A	Jun 2009
Milestone B	N/A	May 2014	N/A	May 2014
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	Jul 2019	N/A	Dec 2019
Total Cost (TY \$M)	N/A	1594.2	N/A	1446.3
Total Quantity	N/A	1	N/A	1
PAUC	N/A	1594.200	N/A	1446.300



**Cost Variance**

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1594.2	--	--	1594.2
Previous Changes				
Economic	-12.7	--	--	-12.7
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-126.6	--	--	-126.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-139.3	--	--	-139.3
Current Changes				
Economic	-0.1	--	--	-0.1
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-8.5	--	--	-8.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-8.6	--	--	-8.6
Total Changes	-147.9	--	--	-147.9
Current Estimate	1446.3	--	--	1446.3

Summary BY 2014 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1567.7	--	--	1567.7
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-122.3	--	--	-122.3
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-122.3	--	--	-122.3
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-7.8	--	--	-7.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-7.8	--	--	-7.8
Total Changes	-130.1	--	--	-130.1
Current Estimate	1437.6	--	--	1437.6

Previous Estimate: December 2018

RDT&E	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.1
Revised estimate due to rescission in FY 2018. (Estimating)	-7.4	-8.0
Revised estimate due to Small Business Innovation Research in FY 2019. (Estimating)	-0.5	-0.6
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.1
RDT&E Subtotal	-7.8	-8.6

## Contracts

Contract Identification	
<b>Appropriation:</b>	RDT&E
<b>Contract Name:</b>	Space Fence
<b>Contractor:</b>	Lockheed Martin Corp.
<b>Contractor Location:</b>	199 Borton Landing Rd Moorestown, NJ 08057
<b>Contract Number:</b>	FA8709-14-C-0001
<b>Contract Type:</b>	Fixed Price Incentive(Firm Target) (FPIF), Cost Plus Fixed Fee (CPFF), Cost (CR)
<b>Award Date:</b>	June 02, 2014
<b>Definitization Date:</b>	June 02, 2014

Contract Price							
Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
914.7	977.8	1	901.2	971.7	1	923.4	923.1

### Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to multiple awarded Engineering Change Proposals, and requests for equitable adjustment due to differing site conditions.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (2/20/2020)	-53.2	0.0
Previous Cumulative Variances	-30.4	-25.6
Net Change	-22.8	+25.6

### Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to the extended government test period and deficiency resolution efforts.

The favorable net change in the schedule variance is due to achievement of all remaining schedule milestones.

### Notes

Contract performance data is based solely on CLIN 0001 data from the contract.

This contract is more than 90% complete; therefore, this is the final report for this contract.

## Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	1	1	1	100.00%
Production	0	0	0	--
Total Program Quantity Delivered	1	1	1	100.00%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	1446.3	Years Appropriated	15
Expended to Date	1377.0	Percent Years Appropriated	100.00%
Percent Expended	95.21%	Appropriated to Date	1446.3
Total Funding Years	15	Percent Appropriated	100.00%

The above data is current as of February 26, 2020.

## Operating and Support Cost

### Cost Estimate Details

<b>Date of Estimate:</b>	May 01, 2014
<b>Source of Estimate:</b>	CAPE ICE
<b>Quantity to Sustain:</b>	1
<b>Unit of Measure:</b>	System
<b>Service Life per Unit:</b>	20.00 Years
<b>Fiscal Years in Service:</b>	FY 2019 - FY 2039

Space Fence Inc 1 unit of measure (system) consists of one control center and one radar site.

### Sustainment Strategy

The Space Fence System will employ a two level maintenance and support concept (organizational and depot) similar to the current Space Surveillance Network sensors. The development contractor will provide Interim Contractor Support (ICS), for both organizational and depot, for Increment 1 of the Space Fence system for up to two years after IOC for Kwajalein Atoll, Marshall Islands. During the ICS period, the contractor will perform both organizational and depot level maintenance on the Space Fence weapon system.

The Space Fence Depot Source of Repair is complete and has indicated all Space Fence depot repairable workload (hardware and software) as well as cryptological equipment is considered core workload. Oklahoma City Air Logistics Center (OC-ALC) is designated as the depot for hardware and software and the Cryptologic Systems Group in San Antonio, TX is designated as the depot for cryptological equipment.

Planning activity for the depot maintenance with OC-ALC is underway to identify depot requirements and ensure proper activation of the sustainment capability at OC-ALC. As the activities progress, the information gained from the process, as well as the business case analysis, will influence sustainment support strategy after full operational capability. This will ensure the best mix of public and/or private capabilities will be used to sustain the system while meeting statutory requirements. Three essential areas are being addressed: (1) item management of parts (supply source), (2) depot repair, i.e., software/hardware maintenance, and (3) depot management type activities.

System logistics support for the Space Fence Inc 1 program will be performed over the life of the system, expected to be 20 years. This support includes maintenance and periodic technology refreshes to assure the system continues to meet required performance, and allows upgrades when mission requirements dictate as well as the government management of these processes.

The full product support package, including technical orders, support equipment, training, and initial spares, will be delivered by the development contractor prior to fielding, which will enable full sustainment of the system.

### Antecedent Information

The Antecedent system is Air Force Space Surveillance System (AFSSS). AFSSS estimates are based on one unit with a service life of 15 years (FY 1998 to FY 2013). The AFSSS was closed October 1, 2013. Cost details were provided by the Air Force Total Ownership Cost database.

Annual O&S Costs BY2014 \$M		
Cost Element	Space Fence Inc 1 Average Annual Cost Per System	Air Force Space Surveillance System (AFSSS) (Antecedent) Average Annual Cost Per System
Unit-Level Manpower	5.221	0.705
Unit Operations	16.990	5.050
Maintenance	2.422	1.240
Sustaining Support	11.262	1.432
Continuing System Improvements	14.224	0.610
Indirect Support	9.828	1.595
Other	0.274	0.000
<b>Total</b>	<b>60.221</b>	<b>10.632</b>

Other costs include Depot Standup amortized over the 20 year design life.

Item	Total O&S Cost \$M			
	Space Fence Inc 1		Air Force Space Surveillance System (AFSSS) (Antecedent)	
	Current Development APB Objective/Threshold	Current Estimate		
<b>Base Year</b>	1208.6	1329.5	1204.3	159.5
<b>Then Year</b>	1554.1	N/A	1554.1	0.0

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

#### Equation to Translate Annual Cost to Total Cost

Total O&S Costs = Unitized cost \* number of systems \* service life per system

Total O&S Costs = \$60.221M \* 1 Space Fence Inc 1 system \* 20 year design life = \$1204M

O&S Cost Variance		
Category	BY 2014 \$M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2018 SAR	1204.3	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
<b>Total Changes</b>	<b>0.0</b>	
Current Estimate	1204.3	

**Disposal Estimate Details**

<b>Date of Estimate:</b>	May 01, 2014
<b>Source of Estimate:</b>	CAPE ICE
<b>Disposal/Demilitarization Total Cost (BY 2014 \$M):</b>	4.3