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Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

Modernized Selected Acquisition Report (MSAR) F-15 EX MDAP (F-15 EX MDAP)

FY 2025 President's Budget

Effective: December 31, 2023

Defense Acquisition Visibility Environment

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(U) Common DoD Abbreviations

\$B	Billions of Dollars
\$K	Thousands of Dollars
\$M	Millions of Dollars
ACAT	Acquisition Category
Acq O&M	Acquisition-Related Operations and Maintenance
ADM	Acquisition Decision Memorandum
APA	Additional Performance Attribute
APB	Acquisition Program Baseline
APPN	Appropriation
APUC	Average Procurement Unit Cost
BA	Budget Authority or Budget Activity
Blk	Block
BY	Base Year
CAE	Component Acquisition Executive
CAPE	Cost Assessment and Program Evaluation
CARD	Cost Analysis Requirements Description
CCE	Component Cost Estimate
CCP	Component Cost Position
CDD	Capability Development Document
CLIN	Contract Line Item Number
CPD	Capability Production Document
CY	Calendar Year or Constant Year
DAB	Defense Acquisition Board
DAE	Defense Acquisition Executive
DAES	Defense Acquisition Executive Summary
DAVE	Defense Acquisition Visibility Environment
DoD	Department of Defense
DSN	Defense Switched Network
EMD	Engineering and Manufacturing Development
EVM	Earned Value Management
FD	Full Deployment
FDD	Full-Deployment Decision
FMS	Foreign Military Sales
FOC	Full Operational Capability
FRP	Full-Rate Production
FY	Fiscal Year
FYDP	Future Years Defense Program
ICD	Initial Capabilities Document
ICE	Independent Cost Estimate
Inc	Increment
IOC	Initial Operational Capability
IT	Information Technology
JROC	Joint Requirements Oversight Council
KPP	Key Performance Parameter
KSA	Key System Attribute

LRIP	Low-Rate Initial Production
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MILCON	Military Construction
N/A	Not Applicable
O	Objective
O&M	Operations and Maintenance
O&S	Operating and Support
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
PAUC	Program Acquisition Unit Cost
PB	President's Budget
PE	Program Element
PEO	Program Executive Officer
PM	Program Manager
POE	Program Office Estimate
R&MF	Revolving and Management Funds
RDT&E	Research, Development, Test, and Evaluation
SAR	Selected Acquisition Report
SCP	Service Cost Position
T	Threshold
TBD	To Be Determined
TY	Then Year
U.S.	United States
U.S.C	United States Code
UCR	Unit Cost Reporting
USD(A&S)	Under Secretary of Defense (Acquisition and Sustainment)

(U) Program Description**Full Name**

F-15 EX MDAP

Short Name

F-15 EX MDAP

PNO

725

Milestone Decision Authority

Component Acquisition Executive

Lead Component

Department of the Air Force

Program Executive OfficeFighters and Advanced Aircraft Directorate
(AFPEO/F&AA)**Joint Program**

No

Acquisition Type

Major Defense Acquisition Program

Adaptive Acquisition Pathway

Major Capability Acquisition

Acquired Systems

F-15 EX

Acquisition Category

IB

Acquisition Status

Active Acquisition

Mission

The F-15EX is based on the 2-seat F-15QA (Qatar) configuration upgraded with USAF-only capabilities, including the Eagle Passive Active Warning and Survivability System (EPAWSS) and the Suite 9.1 Operational Flight Program (OFP) software. With two seats, it will be multirole-capable and operable by one or two aircrew. Many F-15C/Ds are beyond their service life and have SERIOUS structure risks, wire chafing issues, and obsolete parts. Readiness goals are unachievable due to continuous structural inspections, time-consuming repairs, and on-going modernization efforts. The average F-15C/D is 38 years old and 75% of the fleet have exceeded their 9,000-hour certified service life. The oldest F-15C was delivered in 1979. F-15EX logistics, maintenance, and training will heavily leverage existing F-15 infrastructure.

(U) Responsible Office

Program Executive Officer

Fighters and Advanced Aircraft Directorate
(AFPEO/F&AA)

Brig Gen Jason D. Voorheis

jason.voorheis@us.af.mil (primary)

(397) 904-4701 (commercial)

Program Manager

F-15 Division

Col Robert J. McFarland

robert.mcfarland.1@us.af.mil (primary)

(478) 926-2901 (commercial)

(U) Executive Summary

Program Highlights Since Last Report

The FY 2025 PB includes 80 F-15EX aircraft in Lots 1 through 5 funded between FY 2020 and FY 2024, with funding for the procurement of 18 additional F-15EX aircraft in Lot 6 with FY 2025 funds. In addition to the 80 F-15EX funded between FY 2020 and FY 2024 in Lots 1 through 5, the FY 2025 PB includes funding for the procurement of 18 additional F-15EX aircraft in Lot 6 with FY 2025 funds. These 18 aircraft are planned to be the final Lot of F-15EX aircraft procured, for a total Program quantity of 98 F-15EX aircraft.

Since the last report, all F-15EX test aircraft have been delivered to Eglin Air Force Base, with EX-3 through EX-6 joining EX-1 and EX-2 for continued software and weapons certification for the F-15EX fleet.

In August 2023, F-15EX aircraft participated in the platforms nineteenth large force exercise, Combat Hammer, demonstrating the multirole capacity and capabilities of the platform with a loadout of twelve AIM-120 Advanced Medium-Range Air-to-Air Missile beyond-visual-range air-to-air missiles and three AGM-158 Joint Air-to-Surface Standoff Missiles.

In September 2023, the F-15EX Program completed the collective definitization of the Lot 2 and Lot 3 Undefined Contract Action (UCA) aircraft contracts and awarded the Lot 4 aircraft contract without UCA to Boeing. A request for proposal for the collective Lot 5 and Lot 6 aircraft contracts was released in June 2023 for the FY 2024 and FY 2025 funded aircraft with contract award anticipated by the end of July 2024. Contracts for F110-GE-129 General Electric Engines, APG-82 Raytheon Radars, and many Avionics Line Replaceable Units were separately awarded for these aircraft Lots directly with the Original Equipment Manufacturers throughout the year.

Finally, the F-15EX Initial Operational Test & Evaluation and Live Fire Test & Evaluation was completed in November 2023, with the Director of Operational Test & Evaluation (DOT&E) finding the F-15EX operationally effective in all its air superiority roles, including defensive and offensive counter-air, as well as basic air-to-ground capability. The DOT&E also found F-15EX operationally suitable and survivable against threats likely to be encountered while performing its missions in threat environments.

A Full Rate Production Decision is scheduled in 3rd Quarter FY 2024 following delivery of the last Lot 1B configuration of the first eight LRIP aircraft, and to obtain approval to award Lot 5 and Lot 6 aircraft. Follow-On Test & Evaluation with DOT&E oversight will evaluate the Lot 3+ configuration, with expected completion in 2nd Quarter FY 2025.

Key Risks:

The F-15EX Program is actively working to mitigate two key risks:

FMS Cyber Security Vulnerabilities: The F-15 Qatar and F-15 Saudi FMS Programs, from which the F-15EX is derived, were not designed with USAF cybersecurity requirements. Independent Government-led requirement analysis and cyber testing which encompassed the F-15EX platform cyber architecture was performed, including at system integration labs. However, risk

reduction activities will be completed later than initially planned due to the aircraft production schedule delays, which delayed the planned on-aircraft cyber testing for Lot 1B test aircraft in Calendar Year 2024 by seven months. Cyber on-aircraft testing is scheduled 2nd quarter FY 2024, with report expected no later than 4th quarter FY 2024. The Program will continuously monitor and evaluate cyber risks throughout the Program lifecycle following the DoD Risk Management Framework process.

Part Shortage Challenges (Lots 2+): While part shortage challenges were mitigated for Lot 1B aircraft deliveries, they remain for future Lots of aircraft. Key risk areas for Lot 2 aircraft and beyond include Elbit Large Area Displays, Elbit Low Profile Heads Up Displays, General Dynamics Gun Systems, and Collins Cartridge- and Propellant-Actuated Devices. If these parts are not delivered to the Boeing production line on schedule, then aircraft deliveries will be delayed beyond the currently planned aircraft production dates. These parts are Contractor Furnished Equipment; however, the Government team has engaged heavily in Boeing/USAF/Supplier meetings and sub-supplier site visits to understand the details and work mitigation plans for each of these parts. Additionally, the team continues to investigate Government harvesting solutions from divesting aircraft as well as borrow/payback arrangements with F-15 FMS customers to keep the F-15EX production line on track.

Key Issues:

F-15EX Lot 1B aircraft production line has experienced numerous manufacturing delays relative to the forward fuselage section, which was redesigned from the F-15 Qatar Program to in-source the manufacturing and assembly of this section of the aircraft from Korean Aerospace Industries to Boeing St Louis for F-15EX. The resultant impact of these compounded issues producing this aircraft section in St Louis has driven significant schedule delays, between four to seven months, to Lot 1B aircraft deliveries. Lot 1B aircraft did not meet their contractual delivery dates in FY 2023. Completion of Lot 1B will not occur until EX-7 and EX-8 are delivered, which is currently expected by end of June 2024. The Program will actively monitor this as a risk to Lots 2+ aircraft deliveries until the demonstrated performance of the production line has improved.

Defense Cost and Resource Center Cost and Software Data Reporting Compliance Rating: RED

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

(U) History of Significant Developments Since Program Inception

Date	Description
June 2020	F-15EX Middle Tier Rapid Fielding program Authority to Proceed approved by SAF/AQ.
September 2022	The F-15EX program transitioned from a MTA program to a MCA, as approved by the MDA on September 6, 2022.
November 2022	The F-15EX Lot 1 UCA was definitized on November 23, 2022, after receiving OSD Peer Review approval on Friday, November 18, 2022.
September 2023	The F-15EX collective Lot negotiations were completed with the Lot 2 and Lot 3 aircraft UCA definitized and F-15EX Lot 4 aircraft contract awarded on September 28, 2023.
November 2023	F-15EX Initial Operational Test & Evaluation and Live Fire Test & Evaluation was completed with the DOT&E finding the F-15EX to be operationally effective in all its air superiority roles, including defensive and offensive counter-air against surrogate fifth-generation adversary aircraft, as well as basic air-to-ground capability.

(U) Schedule

(U) Schedule Events

Events		Production APB (Milestone) 9/6/2022 Objective	Production APB (Current) 9/6/2022 Objective / Threshold		Current Estimate 12/31/2023	Actual
First Aircraft Delivery	Other	Jul 2021	Jul 2021	Apr 2022	-	11 Mar 2021
Required Assets Available (IOC)	RAA	Jul 2023	Jul 2023	Jul 2024	Jun 2024	-
Full-Rate Production Decision	FRP Decision	Sept 2023	Sept 2023	Jun 2024	Apr 2024	-
Required Assets Available (FOC)	RAA	Jul 2026	Jul 2026	Jul 2027	Jun 2026	-

Notes

None

Schedule Baseline Deviation Explanation

None

(U) Current Significant Schedule Risks and Risks Identified at Milestones/Decisions

Event	Date	Description
Current	2/5/2024	<p>Title: Part Shortage Challenges (Lots 2+)</p> <p>Risk: Part shortage challenges were mitigated for Lot 1B aircraft deliveries, but remain for future Lots of aircraft. Key risk areas for Lot 2 aircraft and beyond include large area displays, low profile heads up displays, gun systems, and cartridge- and propellant-actuated devices. If these parts are unable to be delivered to the Boeing production line on schedule then aircraft deliveries will be delayed beyond currently planned aircraft production dates.</p> <p>Mitigation: These parts are contractor furnished equipment; however, the Government team has engaged heavily in resolving these issues including supplier site visits for mitigation plans and details for each of these parts. Additionally, the team continues to investigate Government harvesting solutions from divesting aircraft as well as borrow /payback arrangements with F-15 FMS customers to keep the F-15EX production line on track.</p>

(U) Performance

(U) Performance Attributes

REDACTED		
Current Estimate 12/31/2023		
Demonstrated Performance 12/31/2023		
Production APB (Current) 9/6/2022	Objective	
	Threshold	
Production APB (Milestone) 9/6/2022	Objective	

(U) Requirement Source:

Sponsor(s): United States Air Force

1. Rapid Fielding Requirements Document, *Rapid Fielding Requirements Document*
Validated By: ACC, August 17, 2020

Notes

None

Performance Deviation Explanation

None

(U) Acquisition Budget Estimate**(U) Total Acquisition Estimates and Quantities**

Category (\$M) Base Year: 2020	Production APB (Milestone) 9/6/2022		Production APB (Current) 9/6/2022		Current Estimate PB 2025	
	CY\$ obs Objective		CY\$ obs Objective / Threshold		CY\$ obs / TY\$ obs	
RDT&E	782.0		782.0	860.2	825.5	922.3
Procurement	7,535.0		7,535.0	8,288.5	9,496.1*	11,615.9
Total Acquisition	8,317.0		8,317.0	-	10,321.6	12,538.2
Program Acquisition Unit Cost	106.628		106.628	117.291	105.323	127.941
Average Procurement Unit Cost	99.145		99.145	109.059	98.918	120.999
Program End-Item Quantity						
Development	2		2		2	
Procurement	76		76		96	
O&M-Acquired	-		-		0	

* Baseline Deviation

Budget Notes

The APB reflects Quantities and Costs approved on September 6, 2022 when the F-15EX program transitioned from MTA to MCA. The threshold for total Procurement and total O&S is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the APB. An updated APB to reflect current quantities is being prepared for the FRP Decision.

Quantity Notes

The FY 2025 PB, the total quantity of 98 is a 20 aircraft increase from the APB quantity of 78; and a six aircraft decrease from the FY 2024 PB quantity of 104 aircraft.

Cost Baseline Deviation Explanation

Parameter	Explanation
Acquisition Cost (Procurement)	The APB reflects quantities and costs approved on September 6, 2022, when the F-15EX program transitioned from Rapid Fielding to MCA. The threshold for total Procurement and total Operating & Support Cost is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the September 6, 2022 APB. The program is preparing an updated APB in alignment with a SCP to reflect the increased aircraft quantities to be signed no later than the Full Rate Production Decision milestone event.

(U) Risk and Sensitivity Analysis

Current Procurement Estimate Risks (12/31/2023)	
1	Title: Procurement and O&S Cost Risk Risk: The APB reflects Quantities and Costs approved on September 6, 2022 when the F-15EX program transitioned from MTA to MCA. The threshold for total Procurement and total O&S is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the APB. Mitigation: An updated APB to reflect current quantities is being prepared for the FRP Decision.
Current Baseline Risks (9/6/2022)	
None	
Original Baseline Risks (9/6/2022)	
None	

(U) Unit Costs

(U) Current Estimate Compared with Current Baseline

Category (CY\$M) Base Year: 2020	Current Baseline 09/06/2022	Current Estimate PB 2025	% Change
Program Acquisition Unit Cost			
Acquisition Cost	8,317.0	10,321.6	
Program Quantity	78	98	
PAUC	106.628	105.323	-1.22%
Average Procurement Unit Cost			
Procurement Cost	7,535.0	9,496.1	
Procurement Quantity	76	96	
APUC	99.145	98.918	-0.23%

(U) Current Estimate Compared with Original Baseline

Category (CY\$M) Base Year: 2020	Original Baseline 09/06/2022	Current Estimate PB 2025	% Change
Program Acquisition Unit Cost			
Acquisition Cost	8,317.0	10,321.6	
Program Quantity	78	98	
PAUC	106.628	105.323	-1.22%
Average Procurement Unit Cost			
Procurement Cost	7,535.0	9,496.1	
Procurement Quantity	76	96	
APUC	99.145	98.918	-0.23%

(U) Cost Growth Details

Impacts of Schedule Changes on Unit Cost

Not Applicable.

Impacts of Performance Changes on Unit Cost

Not Applicable.

Actions taken or Proposed to Control Future Cost Growth

Not Applicable.

Status of Each Major Contract and Significant Factors Contributing to Cost and Schedule Variance; Projected Effects on Future Program Costs

See Contracts section.

Notes

The APB reflects Quantities and Costs approved on September 6, 2022 when the F-15EX program transitioned from MTA to MCA. The threshold for total Procurement and total O&S is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the APB. An updated APB to reflect current quantities is being prepared for the FRP Decision.

(U) Life-Cycle Costs

(U) Operating and Support and Disposal Cost Estimates Compared with Baseline

Category (\$M)	Base Year: 2020	Production APB (Milestone) 9/6/2022 CY\$ obs Objective	Production APB (Current) 9/6/2022 CY\$ obs Objective / Threshold		Current Estimate CY\$ obs / TY\$ obs	
Total O&S		23,202.0	23,202.0	25,522.2	31,860.7*	63,132.8
Total Disposal		-	-	-	20.0	68.5

* Baseline Deviation

(U) Current Cost Estimate Sources

Operating and Support Cost

Type: Service Cost Position (SCP)

Approved by: AFCAA, February 29, 2024

Note: Then Year Total O&S costs are \$63,132.8M. The Life Cycle Costs are based upon a February 29, 2024 Air Force SCP for a total aircraft quantity of 98. This is an increase from the December 2022 SAR estimate of 78 aircraft.

Disposal/Demilitarization Cost

Type: Service Cost Position (SCP)

Approved by: AFCAA, February 29, 2024

Operating and Support Baseline Deviation Explanation

The APB reflects quantities and costs approved on September 6, 2022, when the F-15EX program transitioned from Rapid Fielding to MCA. The threshold for total Procurement and total Operating & Support Cost is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the September 6, 2022 APB. The program is preparing an updated APB in alignment with a SCP to reflect the increased aircraft quantities to be signed no later than the Full Rate Production Decision milestone event.

Cost Notes

Sustainment Strategy

The O&S Cost current estimate includes the FY 2023 defined quantity of 98 F-15EX through FY 2025 and uses the SCP for FY 2026 and beyond:

The overall F-15EX product support strategy will leverage existing capabilities to the maximum extent possible to rapidly and cost effectively field new aircraft. To achieve the best possible sustainment support, the F-15EX product support strategy depends on both organic and commercial industry support. The baseline plan maintains at least the current level of organic sustainment which exists on legacy United States Air Force F-15s with the objective of systematically increasing organic sustainment as the program matures. With that objective in

mind, the F-15EX [insert contract name] contract has requirements to obtain a Technical Data Package that will enable more F-15 components to be organically maintained as well as increase the organic capabilities to perform OFP upgrades.

Common components already in the supply system will be sustained using existing Government processes and infrastructure. Components unique to the F-15EX will initially be sustained using Interim Contractor Support (ICS) until the long-term sustainment strategy for those unique components is determined through the Depot Source of Repair process. ICS will cover supply support for F-15EX-unique components, field service representatives, repairs, and sustaining engineering. ICS is expected to be required for approximately five years and will be awarded in one-year increments while organic sustainment capabilities are established.

O&S and Disposal Cost Sources: For Programs with an O&S Cost estimate or Disposal Cost estimate the O&S Cost Source and Disposal Cost Source listed in the MSAR are inaccurate due to a system limitation. See MSAR Supplement for corrected source(s).

(U) Operating and Support Variance with Prior Estimate

(CY\$M) Base Year: 2020	Estimate	
Prior Estimate (12/31/2022)	23,131.8	
Current Estimate	31,860.7	
Category		
	Variance	Explanation
Unit-Level Manpower	1,788.2	The previous SAR O&S estimate was for a quantity of 78 aircraft. The current SAR O&S estimate is for a quantity of 98 aircraft. Updated ULM inputs, reduction in aircraft overhaul frequency from 10 to 8 years. Updated escalation indices.
Unit Operations	1,917.1	The previous SAR O&S estimate was for a quantity of 78 aircraft. The current SAR O&S estimate is for a quantity of 98 aircraft. Updated ULM inputs, reduction in aircraft overhaul frequency from 10 to 8 years. Updated escalation indices.
Maintenance	4,483.4	The previous SAR O&S estimate was for a quantity of 78 aircraft. The current SAR O&S estimate is for a quantity of 98 aircraft. Updated ULM inputs, reduction in aircraft overhaul frequency from 10 to 8 years. Updated escalation indices.
Sustaining Support	808.7	The previous SAR O&S estimate was for a quantity of 78 aircraft. The current SAR O&S estimate is for a quantity of 98 aircraft. Updated ULM inputs, reduction in aircraft overhaul frequency from 10 to 8 years. Updated escalation indices.
Continuing System Improvements	-268.5	The previous SAR O&S estimate was for a quantity of 78 aircraft. The current SAR O&S estimate is for a quantity of 98 aircraft. Updated estimating methodologies and assumptions. Updated escalation indices.
Other	0.0	

(CY\$M) Base Year: 2020	Estimate
Not Categorized	-0.0

(U) Operating and Support Cost Element Structure Estimates by Acquired System

(CY\$M) Base Year: 2020							
System	Unit-Level Manpower	Unit Operations	Maintenance	Sustaining Support	Continuing System Improvements	Other	Total
F-15 EX	10,167.2	4,907.6	13,028.1	2,690.6	1,067.3	0.0	31,860.7
Program	10,167.2	4,907.6	13,028.1	2,690.6	1,067.3	0.0	31,860.7

(U) Annual Operating and Support Costs per Unit Compared with Antecedent System

(CY\$M) Base Year: 2020							
System	Unit-Level Manpower	Unit Operations	Maintenance	Sustaining Support	Continuing System Improvements	Other	Total
F-15 EX	3.5	1.7	4.4	0.9	0.4	0.0	10.8

(U) Operating and Support Cost Estimate Assumptions

System	Quantity to Sustain	Unit Expected Service Life (Years)	Unit of Measure	Fiscal Years Operational
F-15 EX	98	30.0	EA / TAI	2021 - 2068

Additional O&S Estimate Assumptions

None

Antecedent Estimate Assumptions

None

O&S Annual Cost Calculation Memo

None

(U) Technologies and Systems Engineering

(U) Current Significant Technical Risks and Risks Identified at Milestones/Decisions

Event	Date	Description
Current	12/31/2023	<p>Title: FMS Cyber Security Vulnerabilities Risk: F-15SA and F-15QA aircraft were not designed to USAF cybersecurity requirements. Therefore, the cybersecurity risks are unknown for the inherited FMS subsystems when the program started. If subsystems developed under these FMS programs exhibit cybersecurity vulnerabilities, then F-15EX may be susceptible to cybersecurity threats and have schedule and cost impacts to correct deficiencies to obtain an authority to operate. Mitigation: Rather than requiring full cybersecurity compliance from the onset, which would have delayed initial F-15EX aircraft deliveries, the program performed independent Government-led testing to determine the actual vulnerabilities. Independent Government-led requirement analysis and cyber testing has been completed the system security working groups, including mission-based risk assessment process for cyber and system integration lab cyber testing. This risk will be reduced with the planned on-aircraft cyber testing to be completed on Lot 1B test aircraft into Calendar Year 2024. The program will then continuously monitor and evaluate cyber risks throughout the program lifecycle following the DoD risk management framework process.</p>

(U) Performing Activities and Contracts

(U) External Government Activities

None

(U) Contracts and Efforts

Contract Title	Contract Number / Effort	Contractor	Phase
F-15EX Lot 1 Aircraft & NRE	FA863420D2704	THE BOEING COMPANY	Production
F-15EX Lot 2 Aircraft & NRE	FA863420D2704	THE BOEING COMPANY	Production
F-15EX Lot 3 Aircraft & NRE	FA863420D2704	THE BOEING COMPANY	Production
F-15EX Lot 4 Aircraft & NRE	FA863420D2704	THE BOEING COMPANY	Production

(U) Contract and Effort Identification, Price, Quantity and Performance

Contract Number:	FA863420D2704	Order Number:	FA863420F0022
Contract Title:	F-15EX Lot 1 Aircraft & NRE	Strategy:	FAR 15: Negotiated Contracts
CAGE:	76301 - THE BOEING COMPANY	Contracting Office:	AFLCMC/WAQ - F-15 Division
City, State/Province:	SAINT LOUIS, MO		
Effort Number:	-	Supported Phase:	Production
Type:	Fixed-Price Incentive (Firm Target)	Award Date:	July 13, 2020
Latest Modification Date:	-	Definitization Date:	November 30, 2022
Latest Modification No.:	-	Work Start Date:	July 13, 2020
Technical Data Rights:	-		
Notes:	This contract will deliver 8 F-15EX Aircraft and all associated non-recurring engineering costs.		

Target Price Change Explanation

Initial Contract Price reflect the original Undefined Contract Action (UCA) Not To Exceed (NTE) values. Estimated price at completion reflects expected cost performance between target and ceiling based upon current data which includes the definitized contract prices.

Initial Price (TY \$M) Target / Ceiling	Current Price (TY \$M) Target / Ceiling	Estimate at Completion (TY \$M) Contractor / PM	Initial Quantity	Current Quantity	Delivered Quantity
1,111.7 / 1,111.7	1,038.0 / 1,081.8	1,069.0 / 1,068.9	8	8	6

Work Completed (%): 84.66%
 Cost Variance (TY\$M): -24.9
 Schedule Variance (TY\$M): -14.7

Factors Contributing to Cost Variance and Projected Effects on Program Costs

The cumulative cost variance is unfavorable; driven by Data, Systems Engineering, and Program Management.

Factors Contributing to Schedule Variance and Projected Effects on Program Schedule

The cumulative schedule variance is unfavorable; driven by Avionics, Peculiar Support, and System Test and Evaluation.

(U) Contract and Effort Identification, Price, Quantity and Performance

Contract Number:	FA863420D2704	Order Number:	FA863421F0023
Contract Title:	F-15EX Lot 2 Aircraft & NRE	Strategy:	FAR 15: Negotiated Contracts
CAGE:	76301 - THE BOEING COMPANY	Contracting Office:	AFLCMC/WAQ - F-15 Division
City, State/Province:	SAINT LOUIS, MO		

Effort Number:	-	Supported Phase:	Production
Type:	Fixed-Price Incentive (Firm Target)	Award Date:	July 28, 2021
Latest Modification Date:	-	Definitization Date:	March 15, 2023
Latest Modification No.:	-	Work Start Date:	July 28, 2021
Technical Data Rights:	-		

Notes: This contract will deliver 12 F-15EX Aircraft and all associated non-recurring engineering costs.

Target Price Change Explanation

Initial Contract Price reflect the original UCA NTE values. Estimated price at completion reflects expected cost performance between target and ceiling based upon current data which includes the definitized contract prices.

Initial Price (TY\$M)		Current Price (TY\$M)		Estimate at Completion (TY\$M)		Initial	Current	Delivered
Target / Ceiling		Target / Ceiling		Contractor / PM		Quantity	Quantity	Quantity
1,222.3	1,222.3	1,120.5	1,127.9	1,120.5	1,127.9	12	12	-

Work Completed (%): 67.56%
 Cost Variance (TY\$M): +1.5
 Schedule Variance (TY\$M): -4.5

Factors Contributing to Cost Variance and Projected Effects on Program Costs

The cumulative cost variance is slightly favorable.

Factors Contributing to Schedule Variance and Projected Effects on Program Schedule

The cumulative schedule variance is unfavorable; driven by Data Display and Control.

(U) Contract and Effort Identification, Price, Quantity and Performance

Contract Number:	FA863420D2704	Order Number:	FA863421F0026
Contract Title:	F-15EX Lot 3 Aircraft & NRE	Strategy:	FAR 16.5: Indefinite Delivery Indefinite Quantity
CAGE:	76301 - THE BOEING COMPANY	Contracting Office:	AFLCMC/WAQ - F-15 Division
City, State/Province:	SAINT LOUIS, MO		
Effort Number:	-	Supported Phase:	Production
Type:	Fixed-Price Incentive (Firm Target)	Award Date:	December 30, 2022
Latest Modification Date:	-	Definitization Date:	September 28, 2023
Latest Modification No.:	-	Work Start Date:	December 30, 2022
Technical Data Rights:	-		
Notes:	This contract will deliver 12 F-15EX Aircraft and all associated non-recurring engineering costs.		

Target Price Change Explanation

Initial Contract Price reflect the original UCA NTE values for 10 aircraft aligned to the September 6, 2022 APB of 78 aircraft. Lot 3 was subsequently increased by two aircraft through an Above Threshold Reprogramming action. Estimated price at completion reflects expected cost performance between target and ceiling based upon current data which includes the definitized contract prices.

General Variance Explanation

Variances have been reported on the Lot 3 contract. However, the Lot 3 contract is only 4% complete. Contract EVM efficiency measurement and variance analysis data will not be meaningful until 15-20% complete.

Initial Price (TY\$M) Target / Ceiling		Current Price (TY\$M) Target / Ceiling		Estimate at Completion (TY\$M) Contractor / PM		Initial Quantity	Current Quantity	Delivered Quantity
736.9	736.9	1,035.7	1,120.1	1,096.0	1,120.1	10	12	-

Work Completed (%): 5.80%
Cost Variance (TY\$M): +1.5
Schedule Variance (TY\$M): -0.6

Factors Contributing to Cost Variance and Projected Effects on Program Costs

The cumulative cost variance is slightly favorable.

Factors Contributing to Schedule Variance and Projected Effects on Program Schedule

The cumulative schedule variance is slightly unfavorable.

(U) Contract and Effort Identification, Price, Quantity and Performance

Contract Number:	FA863420D2704	Order Number:	FA863422F0035
Contract Title:	F-15EX Lot 4 Aircraft & NRE	Strategy:	-
CAGE:	76301 - THE BOEING	Contracting Office:	AFLCMC/WAQ - F-15 Division

COMPANY
 City, State/Province: SAINT LOUIS, MO

Effort Number: - Supported Phase: Production
 Type: Fixed-Price Incentive (Firm Award Date: September 28, 2023
 Target)
 Latest Modification Date: - Definitization Date: -
 Latest Modification No.: PZ0001 Work Start Date: September 29, 2022
 Technical Data Rights: -

Notes: This contract will deliver 24 F-15EX Aircraft and all associated non-recurring engineering costs. This contract was awarded with no UCA; therefore there is no definitization date.

Target Price Change Explanation

Initial Contract Price reflect the original contract award values. Estimated price at completion reflects expected cost performance between target and ceiling based upon current data.

General Variance Explanation

Variances have not yet been reported on the Lot 4 contract. Contract EVM efficiency measurement and variance analysis data will not be meaningful until 15-20% complete

Initial Price (TY\$M) Target / Ceiling		Current Price (TY\$M) Target / Ceiling		Estimate at Completion (TY\$M) Contractor / PM		Initial Quantity	Current Quantity	Delivered Quantity
1,899.9	2,065.2	1,899.9	2,065.2	1,920.3	2,065.2	24	24	-

Work Completed (%): -
 Cost Variance (TY\$M): -
 Schedule Variance (TY\$M): -

Factors Contributing to Cost Variance and Projected Effects on Program Costs

Cost variances have not yet been reported on the Lot 4 contract.

Factors Contributing to Schedule Variance and Projected Effects on Program Schedule

Schedule variances have not yet been reported on the Lot 4 contract.

(U) Production**(U) Low-Rate Initial Production**

	Original LRIP Determination	Current LRIP Determination
Total LRIP Quantity	56	56
Date	9/6/2022	9/6/2022
Reference	F-15EX MDAP Transition ADM	F-15EX MDAP Transition ADM
LRIP Period	FY 2021 - 2026	FY 2021 - 2026
Total Procurement Quantity	96	96
LRIP Percentage of Total	58.3%	58.3%

Rationale if LRIP Quantity Exceeds 10% of Total Procurement Quantity (Current Determination)

F-15EX was a FY 2020 New Start. The initial phase of the program was accomplished using the MTA Rapid Fielding authorities provided by Section 804 of the FY 2016 National Defense Authorization Act, resulting in the procurement and fielding of the required test aircraft plus the first squadron of F-15EX aircraft within five years of awarding the contract for the first two production lots. The Air Force transitioned F-15EX to a MCA pathway post-Milestone C on September 6, 2022 to enable procurement of subsequent production lots (Lots 3 and beyond).

The LRIP quantity for F-15EX is 56 aircraft, which represents the quantity that has been procured through Lot 4 prior to the FRP Decision (FRPD) based on the FY 2023 budget request. Fifty-six aircraft is the minimum quantity necessary to permit an orderly increase in the production rate for the system sufficient to lead to full-rate production upon the successful completion of operational testing. Additionally, extending LRIP through Lot 4 addresses the dire need to rapidly refresh the F-15C/D fleet in the near term and prevents a break in production with substantial restart costs. Although this exceeds 10 percent of the total number of articles to be produced, acquiring a significant quantity prior to the FRPD is low risk because the F-15EX aircraft is an integration of mature subsystems.

LRIP Notes

None

(U) Deliveries and Expenditures

(U) Acquisition Funding

	Total Estimate	Actual to Date	Actual, Percent Complete
Years Appropriated	-	-	-
Appropriations (TY, \$M)	12,538.2	12,538.2	100.0%
Expenditures (TY, \$M)	12,538.2	1,858.4	14.8%

(U) End Items Delivered

	Total Required	Planned to Date	Actual to Date	Actual, Percent Complete
Development	2			
F-15 EX		2	2	
Procurement	96			
F-15 EX		6	4	
Total	98	8	6	6.1%

Notes

The FY 2025 PB 98 total quantity is a 20 aircraft increase from the APB quantity of 78; and a 6 aircraft decrease from the FY 2024 PB quantity of 104.

(U) International Program Aspects

General Memo

F-15EX program does not directly own, manage, control, oversee or influence any FMS cases.

Exportability and Business Issues

The F-15EX program leverages significant investments previously made by FMS customers including F-15SA (Saudi) and F-15QA (Qatar). Specifically, the F-15EX is based upon the 2-seat F-15QA (Qatar) configuration upgraded with USAF-only capabilities, including the Eagle Passive Active Warning and Survivability System and Operational Flight Program software. Active FMS cases are in work for potential future production of the exportable F-15 configuration.

Is design for international exportability planned?	Yes	Industry/Partner Exportability Cost-Sharing?	Yes
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Program Protection: Technology Security and Foreign Disclosure Issues

Not Applicable

(U) Agreements

No International Agreements have been defined for F-15 EX MDAP



UNCLASSIFIED

**Modernized
Selected Acquisition Report
Supplement**

**F-15 EX MDAP
(F-15 EX MDAP)**

FY 2025 President's Budget
As of: December 31, 2023

UNCLASSIFIED

MSAR Supplement Sections

Program Description

Program Use of the Adaptive Acquisition Framework

Technologies and Systems Engineering

Funding Sources (Acquisition)

Funding Sources (Operating and Support)

Acquisition Estimate and Quantity Summary

Annual Acquisition Estimates by Appropriation Account

Acquired System Annual End-Item Quantities by Appropriation Account

Nuclear Costs

Operational Fielding Plan

O&S Independent Cost Estimate

Annual Operating and Support Estimates by Cost Element

Program Description

Full Name

F-15 EX MDAP

Short Name

F-15 EX MDAP

PNO

725

Lead Component

Air Force

AAF Pathway

MCA

Acquisition Type

MDAP

Acquired Systems

F-15 EX

Related Programs

Full Name	PNO	Pathway	Type	ACAT/ BCAT	Acquisition Status	Costs in SAR?	
						Acq	O&S

Program Use of the Adaptive Acquisition Framework

The MDA approved the F-15EX Acquisition Strategy on September 24, 2019. The acquisition strategy was amended on June 25, 2021 to support the release of the Lot 3 Request For Proposal. The F-15EX Program is in response to Air Combat Command's capability needs and requirements set forth in the Rapid Fielding Requirements Document (RFRD) for F-15EX approved by the Chief of Staff of the Air Force on February 1, 2019, updated on September 18, 2020 to accommodate a competition for the engines. The RFRD met the intent of a CDD.

To rapidly address the F-15C/D readiness crisis, the initial acquisition strategy was to procure the F-15EX as a predominantly "off-the-line" production program with minimal nonrecurring engineering, mainly focused on software integration efforts. The Air Force also explored technology insertion options to ensure the F-15EX remained a complementary platform to 5th-generation assets operating in highly contested environments.

The initial phase of the F-15EX Program was accomplished using the MTA Rapid Fielding authorities provided by Section 804 of the FY 2016 National Defense Authorization Act. Applying these authorities enabled in the procurement and fielding of the required test aircraft (Lot 1), plus Lot 2, within five years of the first funds obligated which occurred on March 31, 2020. Although F-15EX was designated as a MTA program prior to the issuance of DoDI 5000.80, the F-15EX program met the intent of its provisions.

The Air Force transitioned the F-15EX Program to a traditional MDAP under the MCA Pathway to enable procuring subsequent production lots (Lots 3 and beyond) on September 6, 2022. In preparation for the MDAP Transition Point review, the Program Office updated this Program Strategy Document. The MDA issued a new ADM documenting the program's status as an MDAP and approved the APB and procurement of the third and fourth aircraft lots.

Technologies and Systems Engineering

F-15 EX MDAP

Major Software Efforts

Title	Status	Fielding Date	Description

Major Engineering Changes

Title	Original Need Date	Fielding Date	Description, Rationale and Program Impacts

Funding Sources (Acquisition)

Acquisition Funding Notes

Funding for the F-15EX Program for Lots 2 and beyond is contained in PE 0207146F. This PE does not include the eight aircraft in Lot 1 which were funded in PE 0207134F in FY 2020. In PE 0207134F, two aircraft were procured with RDT&E funds (3600) and six were procured with procurement funds (3010).

The FY 2024 appropriations law and FY 2025 PB budget included funding for additional Budget, Program and Activity Codes (including BP13, BP16 and BP19 funds) not identified in the FY 2025 MSAR Track to Budget tables, these will be incorporated into the FY 2026 MSAR.

F-15 EX MDAP

Category	Account	BA	Line Item	Program Element	RDT&E Project	Shared	Sunk
RDT&E	3600F	07	0207134F - F-15E Squadrons	0207134F	670131 - Initial Operational Test and Eval		
RDT&E	3600F	07	0207146F - F-15EX	0207146F	670131 - Initial Operational Test and Eval		
Procurement	3010F	01	F015E0 - F-15e	0207134F	-		
Note: BP 10: Aircraft Weapon System - Production Procurement							
Procurement	3010F	01	F015EX - F-15EX	0207146F	-		
Note: BP 10: Aircraft Weapon System - Production Procurement							
Procurement	3010F	05	F015EX - F-15EX	0207146F	-		
Note: BP 11: Retrofit - Misc Production Charges							

Funding Sources (Operating and Support)

Note: Budget lines fund activities executed by the Program Office or Sustainment Office.

Operating and Support Funding Notes

There currently are no O&S Cost funding account defined for F-15EX Program. However, the Program has planned FY 2025 O&S funding to support the operational aircraft fielding in FY 2024. Once an O&S Cost account is defined it will be added in to the subsequent MSARs.

F-15 EX MDAP

Category	Account	BA	Line Item	Program Element	RDT&E Project	Shared	Sunk
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Acquisition Estimate and Quantity Summary

F-15 EX MDAP

Acquisition Estimates

Category	PB 2025	TY (\$M)	Current Base Year	Original Base Year	Report Fiscal Year
			CY2020 (\$M)	CY2020 (\$M)	CY2024 (\$M)
RDT&E		922.3	825.5	825.5	976.3
Procurement		11,615.9	9,496.1	9,496.1	11,231.4
MILCON		-	-	-	-
O&M		-	-	-	-
Total Acquisition		12,538.2	10,321.6	10,321.6	12,207.7
PAUC		127.941	105.323	105.323	124.568
APUC		120.999	98.918	98.918	116.994

Acquisition End-Item Quantities

System	PB 2025	Development	Procurement
F-15 EX		2	96
Total		2	96

Unit Description

The APB reflects quantities and costs approved on September 6, 2022, when the F-15EX program transitioned from Rapid Fielding to MCA. The threshold for total Procurement and total Operations & Support Cost is breached due to the addition of 20 aircraft for a total quantity of 98 aircraft compared to the 78 aircraft approved in the September 6, 2022 APB. The program is preparing an updated APB in alignment with a SCP to reflect the increased aircraft quantities to be signed no later than the FRP Decision milestone event.

The FY 2025 PB 98 total quantity is a 20 aircraft increase from the APB quantity of 78; and a six aircraft decrease from the FY 2024 PB quantity of 104.

Current and Future Years Defense Program Summary, TY(\$M)

Appropriation	Prior	2024	2025	2026	2027	2028	2029	To Complete	Total
RDT&E	660.0	104.5	56.2	-	-	-	-	101.6	922.3
Procurement	6,044.5	2,775.5	1,848.6	60.7	-	-	-	886.6	11,615.9
MILCON	-	-	-	-	-	-	-	-	-
O&M	-	-	-	-	-	-	-	-	-
PB 2025 Total	6,704.5	2,880.0	1,904.8	60.7	-	-	-	988.2	12,538.2

Annual Acquisition Estimates by Appropriation Account

(Aligned to Budget Position: PB 2025)

F-15 EX MDAP

Source for TY\$-CY\$ Conversion: SAF/FMCE Raw and Weighted Inflation Indices for DAF Accounts: 17 Mar 2023

3600F - Research, Development, Test & Eval, AF					
fiscal year		Other/ Unallocated	Total TY(\$M)	Weighted Rate	Total CY2020 (\$M)
Total		922.3	922.3	-	825.5
2020		384.992	385.0	1.027949	374.5
2021		79.866	79.9	1.076372	74.2
2022		103.950	104.0	1.134677	91.6
2023		91.178	91.2	1.174669	77.6
2024		104.506	104.5	1.201081	87.0
2025		56.228	56.2	1.226304	45.9
2026			-	1.252056	-
2027			-	1.278350	-
2028			-	1.305195	-
2029			-	1.332604	-
2030		101.579	101.6	1.360589	74.7

Annual Acquisition Estimates by Appropriation Account

(Aligned to Budget Position: PB 2025)

F-15 EX MDAP

Source for TY\$-CY\$ Conversion: SAF/FMCE Raw and Weighted Inflation Indices for DAF Accounts: 17 Mar 2023

3010F - Aircraft Procurement, Air Force									
fiscal year	End Item Recurring Flyaway	Non-End Item Recurring Flyaway	Non-Recurring Flyaway	Initial Spares	Depot Activation	Other/ Unallocated	Total TY(\$M)	Weighted Rate	Total CY2020 (\$M)
Total	9,171.0	241.2	277.4	501.9	-	1,424.5	11,615.9	-	9,496.1
2020	495.617	11.301		16.094		98.089	621.1	1.101728	563.8
2021	1,155.898	7.244	67.584	32.430		27.135	1,290.3	1.148651	1,123.3
2022	1,207.480	27.455	50.597	22.282		89.545	1,397.4	1.185867	1,178.3
2023	2,372.661	25.581	74.638	172.640		90.249	2,735.8	1.214039	2,253.4
2024	2,369.125	118.415	41.818	143.616		102.547	2,775.5	1.239801	2,238.7
2025	1,570.175	51.236	42.782	110.972		73.392	1,848.6	1.265837	1,460.3
2026				3.823		56.891	60.7	1.292420	47.0
2027				-			-	1.319560	-
2028				-			-	1.347271	-
2029	-	-	-	-		-	-	1.375564	-
2030		-	-	-		886.605	886.6	1.404451	631.3

Acquired System Annual End-Item Quantities by Appropriation Account
(Aligned to Budget Position: PB 2025)

F-15 EX MDAP

3600F - Research, Development, Test & Eval, AF				
fiscal year	F-15 EX			Total
Total	2			2
Undistributed				-
2020				-
2021	2			2

Acquired System Annual End-Item Quantities by Appropriation Account
(Aligned to Budget Position: PB 2025)

F-15 EX MDAP

3010F - Aircraft Procurement, Air Force				
fiscal year	F-15 EX			Total
Total	96			96
Undistributed				-
2020	6			6
2021	12			12
2022	12			12
2023	24			24
2024	24			24
2025	18			18

Nuclear Costs

F-15 EX MDAP

Program's Use of Department of Energy Resources

None

Operational Fielding Plan

F-15 EX MDAP

System: F-15 EX

Fielding and Inventory Notes

F-15 EX Fielding Plan and Inventory

fiscal year	Store	Field	Expend/Loss	Decommission	Inventory
2023					2
2024		9			11
2025		18			29
2026		21			50
2027		24			74
2028		24			98
2029					98

O&S Independent Cost Estimate

F-15 EX MDAP

Independent and Current Cost Estimate Comparison

Category	CY2020 (\$M)	Independent Cost Estimate 9/6/2022	Current Estimate 2/29/2024	Variance with ICE (%)
Unit-Level Manpower		8,379.0	10,167.2	21%
Unit Operations		2,990.5	4,907.6	64%
Maintenance		8,544.7	13,028.1	52%
Sustaining Support		1,881.9	2,690.6	43%
Continued System Improvements		1,335.8	1,067.3	-20%
Other		-	-	-
Total O&S		23,131.8	31,860.7	38%

Independent Cost Estimate Source

Event: MDAP Transition Point
 Type: Component Cost Position
 Approved by: Air Force Cost Analysis Agency, September 6, 2022
 Note: Prior SAR O&S - Dec 2022 SAR CY Estimate \$23,131.810.
 The previous SAR O&S was for a quantity of 78 aircraft. The current SAR O&S Estimate is for a quantity of 98 aircraft. Updated inputs, reduction in aircraft overhaul frequency from 10 to 8 years. Updated escalation indices.

Current Cost Estimate Source

Type: Independent Cost Estimate
 Approved by: Air Force Cost Analysis Agency, February 29, 2024

Cost Estimate Variance Explanation

The variance between the FY 2024 CCP and the September 6, 2022 MDAP Transition Point CCP is primarily due to a difference in aircraft being supported. The previous MSAR O&S Cost was for a quantity of 78 aircraft, whereas, the Current MSAR O&S Cost is for a quantity of 98 aircraft. In addition to the quantity change the estimate includes unit level manning inputs updates and reduction in aircraft overhaul frequency from 10-8 years.

Annual Operating and Support Estimates by Cost Element

F-15 EX MDAP

System: F-15 EX

Source for TY-CY Conversion: Prior SAR, Dec 2022

Operating and Support Cost Elements							
fiscal year	1.0 Unit-Level Manpower	2.0 Unit Operations	3.0 Maintenance	4.0 Sustaining Support	5.0 Continuing System Improvements	Other	Total CY2020 (\$M)
Total	10,167.2	4,907.6	13,028.1	2,690.6	1,067.3	-	31,860.7
2025	70.389	36.802	37.492	46.312	11.062		202.1
2026	106.993	46.414	59.194	35.846	13.744		262.2
2027	171.712	73.895	103.671	58.804	19.936		428.0
2028	230.532	101.502	153.305	62.189	26.501		574.0
2029	238.133	115.899	196.405	62.301	26.811		639.5
2030	239.051	117.347	201.404	63.468	26.811		648.1
2031	239.973	117.743	204.450	66.475	26.811		655.5
2032	240.899	118.140	213.815	59.313	26.811		659.0
2033	241.830	118.538	223.180	66.483	26.811		676.8
2034	242.765	118.938	247.278	63.486	26.811		699.3
2035	243.704	119.340	269.282	62.328	26.811		721.5
2036	244.648	119.743	291.285	63.495	26.811		746.0
2037	245.596	120.147	301.663	66.502	26.811		760.7
2038	246.549	120.554	322.516	59.340	26.811		775.8
2039	247.506	120.962	346.511	66.511	26.811		808.3
2040	248.467	121.371	374.695	63.513	26.811		834.9
2041	249.433	121.782	402.880	62.356	26.811		863.3
2042	250.404	122.195	400.689	63.523	26.811		863.6
2043	251.379	122.609	385.928	66.529	26.811		853.3
2044	252.358	123.025	365.931	59.368	26.811		827.5
2045	253.342	123.443	343.839	66.539	26.811		814.0
2046	254.331	123.862	321.746	63.541	26.811		790.3
2047	255.324	124.283	322.698	62.384	26.811		791.5
2048	256.322	124.705	325.744	63.551	26.811		797.1
2049	257.324	125.129	331.723	66.558	26.811		807.5
2050	258.332	125.555	334.769	59.396	26.811		804.9
2051	259.343	125.983	337.815	66.568	26.811		816.5
2052	260.360	126.412	351.126	63.570	26.811		828.3
2053	261.381	126.843	379.101	62.413	26.811		856.5
2054	262.407	127.275	411.475	63.580	26.811		891.5
2055	263.438	127.709	449.715	66.587	26.811		934.3
2056	264.474	128.145	487.955	59.426	26.811		966.8
2057	265.514	128.583	483.669	66.597	26.811		971.2

System: F-15 EX

Source for TY-CY Conversion: Prior SAR, Dec 2022

Operating and Support Cost Elements							
fiscal year	1.0 Unit-Level Manpower	2.0 Unit Operations	3.0 Maintenance	4.0 Sustaining Support	5.0 Continuing System Improvements	Other	Total CY2020 (\$M)
2058	266.560	129.022	461.786	63.600	26.811		947.8
2059	267.610	129.463	432.571	62.443	26.811		918.9
2060	268.665	129.906	400.424	63.610	26.811		889.4
2061	269.725	130.351	368.276	66.617	26.811		861.8
2062	270.790	130.797	368.389	59.456	26.811		856.2
2063	261.476	123.209	277.508	65.647	25.879		753.7
2064	262.500	123.632	280.367	62.650	12.252		741.4
2065	212.117	98.435	224.734	58.106	12.093		605.5
2066	135.078	62.241	143.043	53.467	11.796		405.6
2067	71.731	35.300	81.659	51.023	11.494		251.2
2068	6.711	0.359	6.344	35.122	10.973		59.5