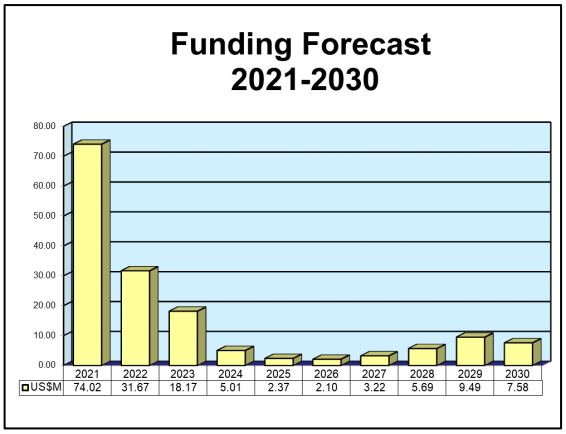
APG-63(V)

Outlook

- No further orders expected
- Production concluded in 2020, after delivery of the final APG-63(V)3 units in support of the U.S. Air Force and Saudi Air Force
- While unlikely, investment in the APG-82 could potentially lead to improvements to the APG-63
- Minimal amounts of funding expected for the next several years; sustaining in-service units



Orientation

Description. Airborne, multimode, pulse-Doppler fire control radar.

The APG-63(V)2 and (V)3 models incorporated an upgraded active electronically scanned array (AESA) versus the APG-63(V)1's mechanically scanned array.

Sponsor

U.S. Air Force
AF Systems Command
Aeronautical Systems Center
ASC/PAM
Wright-Patterson AFB, OH 45433-6503
USA
Tel: + 1 (513) 255-3767
Website: http://www.wpafb.af.mil

Status. In service and production; ongoing logistics support and upgrades.

Application. The APG-63(V) fire control radar is carried by all versions of the F-15 except the F-15E Strike Eagle, F-15SE Silent Eagle, and speculative F-15EX. Select P-3A aircraft also carry the radar.

Price Range. U.S. government FY19 budget documents show an average APG-63(V)3 price of $5.5 million per unit through the life of the program. This includes early and late production units. With necessary non-recurring, change order, and data costs factored in, the price increases to $6.4 million per unit. This does not include any installation or labor costs.

According to FY20 budget estimates, the U.S. Air Force's most recent APG-63(V)3 procurement run, from FY19 through FY21, cost a cumulative $5.0 million for each unit's A-Kit and B-Kit.

An $81.4 million contract awarded in February 2003 for 26 APG-63(V)1 radars yields a unit price of $3.13 million.

APG-63(V)

Contractors

Prime

Raytheon Intelligence & Space	http://www.raytheonintelligenceandspace.com, 2501 W University Dr, McKinney, TX 75071 United States, Tel: + 1 (972) 952-2000, Prime
Boeing Defense, Space & Security	http://www.boeing.com/defense, PO Box 516, St Louis, MO 63166 United States, Tel: + 1 (314) 232-0232, Fax: + 1 (314) 777-1096, Lead Contractor

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

	Metric	**U.S.**
Dimensions		
Weight	221 kg	486 lb
Volume	0.25 m³	9.0 ft³
Characteristics		
Range	161 km	100 nm
Frequency	Selectable in the 8- to 20-GHz band	
MTBMA	120 hr (less antenna) 30-35 hr (demonstrated)	
LRU	9	
Antenna	Planar array	
Gimbal axes	3	
Type scan	Mechanical	
Drive rate	70°/sec	
Field of view	120°	
Operating modes:	Automatic acquisition Super search (HUD frame) Boresight Vertical acquisition (auto/manual lock-on) Auto guns Track-while-scan Range-while-search (high/medium PRF) Velocity search (high PRF) Single target track Weapons delivery Real beam ground map Doppler beam sharpening Ground map Air-to-surface ranging Precision velocity update Fixed and moving ground track Beacon Sniff-passive/active Flood (dogfight)	

Design Features. The APG-63(V) multimode pulse-Doppler fire control radar operates on a number of selectable frequencies. It was designed to support all-altitude, all-aspect attack capabilities and has a look-down, shoot-down capability that presents a clean display even in the presence of heavy ground clutter.

The APG-63(V) has been operational since 1973. It was the first operational airborne radar to incorporate a software-programmable signal processor, allowing the system to respond quickly to new tactics or to accommodate improved modes and weapons through software reprogramming rather than by extensive hardware retrofit. This processor is standard on the radars installed on F-15C/Ds and was retrofitted to the radars on F-15A/Bs.

The APG-63 consists of an antenna, receiver, exciter, cockpit control, transmitter, digital processor, analog processor, and data processor, plus the power supply. A gridded traveling wave tube (TWT) and digital signal processing combine with efficient mode and data management to make operation possible over a wide range of pulse repetition frequencies, pulse widths, and processing modes. These features also enhance the system's performance in an electronic countermeasures environment.

Operational Characteristics. The APG-63(V) radar uses two types of displays. A small cathode ray tube, called the vertical situation display (VSD), is located at the upper left of the control panel; it is used for target acquisition/tracking at long ranges. The VSD presents a "cleaned" synthetic display of computer-processed radar video data that includes alphanumerics and symbols. The alphanumeric information displayed includes target attitude, ground speed, heading, range, aspect angle, closure rate, and *g* force. For engagements or dogfights, the head-up display (HUD) automatically receives information from the radar and displays it for the pilot.

All information needed to intercept and engage a target is displayed on the HUD. This technology is integrated with a hands-on throttle-and-stick (HOTAS). Finger switches allow the pilot to interrogate the radar and select/fire weapons, enabling the pilot to intercept and engage the target without moving his hands from the controls or his eyes from the target. Four air-to-air modes and three air-to-ground modes are selectable, either manually or automatically. A beacon mode for homing or rendezvous use is also provided.

The APG-63(V) provides a clutter-free radar display. It can lock on during rapid roll maneuvers and has an all-aspect, all-altitude capability that permits operation and detection of aircraft and small targets at long or short ranges, during head-on or tail attack, and at high and low altitudes.

The APG-63(V) radar was enhanced by a medium pulsed radio frequency (PRF) waveform that allows the pulse-Doppler system to look up at high-flying targets and look down at low-flying targets. It feeds target information into a central computer for effective weapons delivery. The APG-63(V) can also be used for air-to-surface attack missions.

Aircraft carrying the APG-63(V)2 active electronically scanned array (AESA) feature an improved ability to search and scan, because the antenna does not need to move to point the radar beam. It offers greater precision in detecting tracks and illuminates multiple threats more quickly and effectively than traditional radar.

APG-63(V)

APG-63 Platform: U.S. Air Force F-15C

Source: Staff Sgt. Vince Parker, U.S. Air Force

Variants/Upgrades

APG-70. This version is an upgrade of the APG-63 designed for greater reliability and easier maintenance. Gate array technology enabled the APG-70 to incorporate modes not available in earlier radars while providing enhanced operational capabilities in other modes. The APG-70 is employed on late-model F-15C, D, and E aircraft and on the F-15I and F-15S. The APG-70 is no longer in production.

APG-63(V)1. The APG-63(V)1 was a hardware redesign that offered growth potential and addressed reliability and maintainability problems. The APG-63(V)1 improves mean time between maintenance actions (MTBMA) to 120 hours. The upgrade replaced many obsolete integrated circuits that had become difficult to acquire. The new processor improved performance by increasing throughput and memory capacity.

The APG-63(V)1 used the original antenna and displays without modification, and only minor changes to aircraft interfaces were required. It adapted the APG-70(V) tactical software suite, again with only minor modifications (such as built-in test capability). The functional performance of the upgraded APG-63(V) is equal to or better than that of the APG-70(V) radar.

APG-63(V)2. The APG-63(V)2 kept the radar processor, controls, and displays of the APG-63(V)1, but replaced the hydraulic and electrical antenna drive systems with an AESA that includes 3,600 transmit/receive modules. The upgrade improves system reliability, increases range and sensitivity, and allows F-15 pilots to take full advantage of the AIM-120 air-to-air missile capabilities. The (V)2 also has better anti-jam characteristics. Because the radar can produce a more focused beam, it is more difficult for enemy sensors to detect. The system can perform detection, tracking, communication, and jamming functions simultaneously and can track multiple targets, including cruise missiles and other low-cross-section targets. Eighteen aircraft received the upgrade in 2000.

The radar includes an advanced identification friend or foe (IFF) system and an upgraded environmental control system. The APG-63(V)2 is a major radar upgrade for USAF F-15C aircraft.

APG-63(V)3. This AESA variant uses next-generation tile T/R modules (less than 1 sq in), as opposed to the brick modules (about the size of a small candy bar) installed in the (V)2 radar. This crossover technology from the APG-79(V) program makes the radar about

240 pounds lighter. This eliminates the need for weighting in the tail of the aircraft to maintain balance for the (V)2's added weight.

APX-114. Raytheon long-range IFF interrogator system designed for compatibility with APG-63 series radars. To function with AESA-equipped APG-63s, the AS-4664 IFF electronically steered antenna (ESA) is required.

APG-63(V)3 in an F-15C Nosecone

Source: Raytheon

APG-63(V)

Program Review

Note: *In 2020, the APG-63's manufacturer, Raytheon, merged with UTC, becoming Raytheon Technologies. This report refers to the manufacturer by its name as it was at the date of the information being conveyed.*

Radar for New Generation of Fighters

APG-63(V) development began in the early 1970s and the F-15C/D entered production in 1978. A Programmable Signal Processor (PSP) improved performance in high-resolution ground-mapping modes using Doppler beam sharpening. The PSP enabled the radar to discriminate between multiple targets flying in close proximity. The PSP was retrofitted to 142 F-15C/D aircraft by FY81, becoming a regular part of equipment in production systems after that.

The radar was modified into a synthetic aperture configuration to permit night and all-weather attacks on ground targets from standoff ranges. The modified APG-63(V) radar could produce ground maps at ranges in excess of 100 nautical miles (185.3 km). The map resolution was 8.5 feet (2.6 m). The radar could map an area of 10 square miles at distances of 150 nautical miles (277.9 km).

The USAF accepted the F-15E in February 1984. The F-15E used the APG-70(V), which is based on the APG-63 but more reliable and designed for the F-15E's strike role. The last 43 F-15C/D aircraft produced also received the APG-70(V).

In 1992, the USAF began to address concerns about aging APG-63(V) radars because many components were no longer in production. The Air Force opted for selective replacement of certain components as the most cost-effective way to bring the system up to the desired maintainability standard.

Following a July 1993 *Commerce Business Daily* announcement of an APG-63(V) upgrade program, Hughes Radar Systems was contracted to design an upgrade kit for the APG-63(V) antenna system and displays in September of that year. The APG-63U upgrade would use basic APG-70(V) software with limited changes, keep all existing APG-70(V) modes, and have built-in growth potential. The system nomenclature became APG-63(V)1. Production began in 1999 and ran through 2005.

Upgrade to AESA

In 1999, the Air Force announced that it would once again upgrade the F-15C radar. The APG-63(V)2 AESA controls and displays are nearly identical to those of the mechanically scanned antenna, but enable the F-15C to engage multiple targets with multiple missiles and better identify friendly aircraft. They also improve the plane's environmental control system and offer better situational awareness.

Boeing and Raytheon built the new system under the service's classified "black budget." The radar's most significant feature is its ability to take full advantage of the AIM-120 air-to-air missile. At the same time, the system is more reliable and requires less repair work, as it eliminates the need for several hydraulic and electrical systems. These systems were among the F-15C's components requiring the highest maintenance.

The APG-63(V)2 was deployed on 18 Air National Guard F-15Cs. The program cost the United States $277 million. The F-15s are deployed in Alaska and are tasked with tracking cruise missiles.

APG-63 Successful on International Market

South Korea. The Republic of Korea Air Force originally planned to buy 120 advanced fighters to replace its existing fleet of F-4 Phantoms under the Next Generation Fighter (FX) program. South Korea ordered 40 aircraft in 2002 and placed a follow-on order for 21 F-15Ks in 2008. Boeing completed deliveries of the F-15K Slam Eagles to South Korea in April 2012.

South Korea has a third round of acquisitions planned for the FX program (FX-3). Boeing has submitted an APG-63(V)3-equipped version of the F-15.

Japan. Japan began flight-testing APG-63(V)1 radars in 2003 on its F-15Js. Under the program, Mitsubishi Electric Company (MELCO) produces the radars under license from Raytheon. However, two radars produced by Raytheon were also installed on F-15Js. MELCO began licensed production in 2004 and full-rate production in 2008.

Singapore. After a fierce international competition featuring advanced fighters such as the Dassault Rafale and Eurofighter Typhoon, Singapore selected the F-15SG as an interim fighter in December 2005. The APG-63(V)3 would equip all 24 aircraft to be produced, making Singapore the AESA radar's first international customer. Deliveries began in 2009 and were completed in 2012.

U.S. Contracts and Upgrades

After a series of flight tests of the APG-63(V)3, Raytheon delivered the radar to Boeing in June 2006. Boeing integrated the radar on an F-15 in September of that year and began a new round of flight tests.

In December 2006, the U.S. Air Force awarded Raytheon a $55.8 million contract for seven low-rate initial production (LRIP) APG-63(V)3s for the Air National Guard (ANG) and one for itself. A significant portion of the funding was to be used to start a production line for eventual full-rate production. A contract worth $52 million was awarded in October 2007 to continue this program. Under the latest contract, seven systems will be delivered to the ANG and an additional system will go to the active-duty Air Force.

Later, in March 2008, Boeing was awarded a $130 million contract to upgrade an additional 16 ANG F-15s with the APG-63(V)3. This program could be affected by the aging of F-15 airframes, however. Many of the oldest F-15s in service are beginning to experience structural difficulties because of their age, and the Air Force will be forced to retire many of these aircraft. Nevertheless, radar upgrades are expected to continue, since most of the F-15s that entered service more recently will remain operational. The F-15 is expected to remain in service until 2025.

According to FY12 USAF budget documentation, the service plans to upgrade 69 active-duty Air Force aircraft and 78 ANG fighters. Even though many older F-15s are being retired, the USAF is continuing its upgrade plans. The number of planes to be upgraded will change over time due to structural issues with the aircraft and funding limitations stemming from higher-priority Air Force projects.

In April 2010, the ANG unveiled its first operational APG-63(V)3-equipped F-15C at a roll-out ceremony at the 125th Fighter Wing in Florida. At the same time, Boeing announced that the company was under contract to upgrade 10 Air Force and 14 ANG F-15C/D aircraft with AESA radar.

In November 2010, Raytheon completed acceptance testing of the APG-63(V)3 radar on 10 USAF F-15C aircraft. In December 2010, Raytheon received a follow-on contract from Boeing for APG-63(V)3 radars for USAF and U.S. ANG aircraft. Deliveries began in the second quarter of 2011. Boeing, meanwhile, reported that the company was under contract to upgrade 27 Air Force and 18 ANG F-15C/D aircraft with AESA radar. The contract ran from November 2010 to September 2011.

Japan is currently in the process of upgrading its F-15J/DJ aircraft with an advanced version of the APG-63 radar.

Introducing the APG-82 AESA

In November 2007, Boeing selected Raytheon to upgrade the APG-70 radar on the F-15E Strike Eagle. The new AESA radar was intended to cover all 224 F-15Es currently in USAF service. Raytheon received a $238 million System Design and Development (SDD) contract to develop the new radar.

Raytheon announced plans in September 2009 to maximize efficiencies by producing a new system that combines technologies from previous Raytheon radars. Additionally, the radar includes technology specific to F-15s. The USAF designated the new radar the APG-82.

Boeing includes the new radar on its F-15 Silent Eagle, which is a stealthier version of the fighter introduced in March 2009. The F-15SE is being marketed outside the United States.

The U.S. Air Force is now planning to upgrade all of its F-15E Strike Eagles with the APG-82. More information on the APG-82 radar is provided in a separate report in this service.

Saudi Arabia F-15 Fleet Expansion, Upgrade

In 2010, Saudi Arabia placed requests through the U.S. Foreign Military Sales channel for the purchase of new F-15SA jet fighters, plus upgrades to the existing F-15S fleet to a similar configuration.

The Saudi FMS request – announced to the U.S. Congress by the Pentagon on October 20, 2010 – involved the sale of 84 F-15SA jet fighters and the upgrade of 68 existing Saudi F-15s to the same configuration. Facilities and infrastructure for the F-15SA fleet would be built and/or refurbished; weapons would be purchased; and electronics would be purchased/upgraded.

As part of the electronics package, the F-15SAs and upgraded aircraft are receiving the APG-63(V)3 radar. The buy moved forward on December 29, 2011, when Saudi Arabia signed the letter of offer and acceptance for the new-build F-15SAs. Then, on March 8, 2012, it was announced that the Pentagon had awarded an $11.399 billion fixed-fee contract to Boeing on behalf of the sale. Work on the new-build F-15SAs was expected to be completed by October 2020.

A $3.5 billion contract for the upgrade of the existing Saudi F-15Ss was struck with Boeing in December 2012. The deal covers the production of 68 modification kits that will bring the F-15S to the F-15SA standard. The contract also covers technical order development, integration and testing, fabrication of trial kits to support validation and verification activities, and the procurement and installation of four base stand-up kits. Work under the contract was scheduled to conclude by December 19, 2019.

APG-63(V)

APG-63(V)2 AESA

Source: Raytheon

Funding

U.S. FUNDING

	Prior QTY	Prior AMT	FY19 QTY	FY19 AMT	FY20 QTY	FY20 AMT	FY21 QTY	FY21 AMT
Procurement (U.S. Air Force)								
LI#F01500 – F-15								
6158 – F-15C/D								
APG-63(V)3 Common Config (Reliability & Maintainability)	-	-	-	4.326	-	4.352	-	1.510
APG-63(V)3 Radar Upgrade	196	1,364.928	0	0.011	0	23.681	0	0.000

	FY22 QTY	FY22 AMT	FY23 QTY	FY23 AMT	FY24 QTY	FY24 AMT	FY25 QTY	FY25 AMT
LI#F01500 – F-15								
6158 – F-15C/D								
APG-63(V)3 Common Config (Reliability & Maintainability)	-	0.909	-	0.069	-	-	-	-
APG-63(V)3 Radar Upgrade	0	0.000	0	0.000	0	0.000	0	0.000

	Prior AMT	FY19 AMT	FY20 AMT	FY21 AMT	FY22 AMT	FY23 AMT	FY24 AMT	FY25 AMT
RDT&E (U.S. Air Force)								
PE#0207134F – F-15E Squadrons								
676020 – F-15								
F-15 Radar Enhancements	N/A	45.831	69.523	69.728	N/A	N/A	N/A	N/A

N/A = Not Available

All values are in USD millions.

Sources: U.S. Department of the Air Force, FY21 Budget Estimate, Aircraft Procurement, Air Force, Volume 2, Budget Activity 5, February 2020;
U.S. Department of the Air Force, FY21 Budget Estimate, RDT&E, Air Force, Volume 3A, Budget Activity 7, March 2020

Contracts/Orders & Options

(Contracts over $5 million)

Contractor	Award ($ millions)	Date/Description
Raytheon	55.8	Dec 2006 – Contract for LRIP of the APG-63(V)3. Includes production of six radars and one spare for the ANG as well as one radar for the USAF. Includes start of a manufacturing line to prepare for full-rate production.
Raytheon	52.2	Oct 2007 – Contract from Boeing to provide seven APG-63(V)3s to the U.S. ANG and one system to the USAF. The contract includes production start-up costs so that Raytheon can provide six radars per year, for up to 48 radars.
Boeing	130	Mar 2008 – USAF contract to upgrade 16 USAF and ANG F-15C Eagles with the APG-63(V)3 radar.
Boeing	238	Oct 2008 – SDD contract from the USAF to modernize the radar on F-15E fighter aircraft.
Boeing	97.4	Jul 2012 – FFP contract to provide continued availability of operational APG-63(V)1, APG-63(V)2, and APG-63(V)3 radars after aircraft installation. Work was completed by Dec 31, 2014. (F33657-01-D-0026-RJ64)
Raytheon	N/A	Jun 2013 – Follow-on contract from Boeing to provide the sixth production lot of APG-63(V)3 radars.
Boeing	64.247	Dec 2014 – A not-to-exceed, firm-fixed-price, undefinitized contract for the continued availability of operational APG-63(V)1, APG-63(V)2, APG-63(V)3, and Talon HATE radars. Boeing repaired all field failures and continued parts obsolescence management, maintaining the form, fit, function, and interface of the line replaceable units and built-in test software and the configuration accountability of the fielded radar data. Work was completed by the close of Dec 2015. (F33657-01-D-0026-RJ80)
Raytheon	59.730	Jun 2015 – A requirements contract for spares, repairs, and engineering services in support of various sustainment program offices and systems, including the GPN-22/TPN-25, ALQ-161/-172, APG-63/-70, APX-114, ARC-187, and AAQ-13. The contract involves Foreign Military Sales. Work was expected to be completed by Jun 18, 2020. (FA8522-15-D-0004)
Boeing, Space & Security	558.462	Nov 2016 – Modification (P00015) to a previously awarded contract for F-15 Combined APG-63(V)3 Radar Improvement Program Version 3 and APG-82(V)1 Radar Modernization Program (RMP) upgrades. Boeing would provide procurement, installation, initial spares, and support for 42 APG-63(V)3 RIPV3 and 29 APG-82(V)1 RMP radars. Work was expected to be completed in Jan 2019. (FA8634-16-C-2653)
Boeing	18.291	Feb 2017 – Modification (#14) to a previously awarded contract for the Royal Saudi Air Force APG-63(V)3 radar in F-15SA aircraft. Work was expected to be completed by the end of Mar 2017. (F33657-01-D-0026-RJ80)
Boeing	18.719	Mar 2017 – Modification (#19) to a previously awarded contract to provide sustainment of the APG-63(V)1, APG-63(V)2, APG-63(V)3, and Talon HATE radar systems for the U.S. Air Force Air National Guard and Royal Saudi Air Force. Work was expected to be completed by the end of Jul 2017. (F33657-01-D-0026-RJ80)

APG-63(V)

Contractor	Award ($ millions)	Date/Description
Boeing	168.833	Mar 2017 – Modification (P00028) to a previously awarded contract for Combined APG-63(V)3 Radar Improvement Program and APG-82(V)1 RMP radar upgrades. Boeing will provide 18 APG-63(V)3 radars and 16 APG-81(V)1 radars under the contract, as well as the associated installation, initial spares, support equipment, ICS, tooling, and other required support. Work is expected to be completed by the end of Feb 2022. (FA8634-16-C-2653)
Boeing	7.356	Sep 2017 – A modification (P00037) to a previously awarded contract for the F-15 Combined APG-63(V)3 Radar Improvement Program and APG-82(V)1 RMP radar upgrades. The contract modification provides for one APG-63(V)3 Group B radar kit, and one APG-63(V)3 Group A component subset to be used as a testing and development asset. Contract work is expected to be completed by Feb 28, 2021. (FA8634-16-C-2653)
Boeing	5.244	Jun 2018 – CPFF modification to a previously awarded FPIF $9.6 million target price, $11.2 million ceiling contract for the F-15 Combined APG-63(V)3 Radar Improvement Program. The contract modification provides for the installation of 46 Group A kits and associated travel. Contract work is expected to be completed by Jun 5, 2021. The total face value of the contract is $1.349 billion. (FA8634-16-C-2653)
Boeing	10.8	Nov 2018 – Modification (P00066) to a previously awarded contract for F-15 RMP upgrades, providing for interim contract support repair. Work was expected to be completed Dec 31, 2019. (FA8634-16-C-2653)

N/A = Not Available

April 2010 Unveiling of the U.S. National Guard's APG-63(V)3 AESA Upgrade

Source: U.S. Air Force Master Sgt. Thomas Kielbasa

Worldwide Distribution/Inventories

As of November 2015, Raytheon had delivered 200 APG-63(V)3s. The total has climbed since that time.

In addition to **U.S.** applications, the following international users have been identified:

Israel. The Israeli Air Force acquired 67 F-15s equipped with the APG-63(V). After Congress blocked sales of the APG-70 to Israel, the U.S. sold "detuned" APG-70s to the country.

Japan. The Japan Air Self-Defense Force flies 188 F-15J/DJ aircraft. All aircraft are APG-63(V)-equipped. In October 2019, the U.S. State Department approved a program to replace up to 98 Japanese F-15 APG-63s with the APG-82 radar, which would result in reduced global demand for continued APG-63 support.

The **Republic of Korea** has purchased 61 APG-63(V)1-equipped F-15K aircraft. In 2013, the ROK was approved by the U.S. State Department to upgrade its F-15Ks with an AESA radar (ostensibly the APG-63(V)3), but the country appears to have abandoned any upgrade plans).

Saudi Arabia. Saudi Arabia procured 92 F-15C/Ds equipped with the APG-63(V). In addition, 72 F-15S aircraft were purchased with the detuned APG-70(V).

Saudi Arabia began receiving new F-15SAs with the APG-63(V)3 radar in 2013, and it is concurrently upgrading older F-15C/Ds with the AESA radar.

Singapore has purchased 24 F-15SGs equipped with the APG-63(V)3 to meet its interim fighter requirement.

Forecast Rationale

The primary platform of Raytheon Technologies' APG-63 is the F-15 fighter, an important part of the U.S. Air Force's fighter fleet and those of a number international operators. However, the APG-63 is not specified for the most recent models in the series, the F-15E and forthcoming F-15EX. APG-63 production supports older F-15A/B/C/D models solely, greatly limiting the radar's prospective market as older F-15s increasingly fall out of service.

Until recently, the Royal Saudi Air Force and the U.S. Air Force were upgrading older F-15s with the AESA-equipped APG-63(V)3. The United States will not obtain any further new-build F-15s equipped with the APG-63, instead favoring a more recent F-15 variant equipped with the APG-82 radar.

Deliveries in support of the U.S. Air Force's APG-63(V)3 Radar Modernization Program and the Saudi Air Force's F-15 procurement and upgrades are thought to have ended in 2020.

Future production will be limited by a lack of prospective customers, but APG-63 contractors have an opportunity to win limited funding for RDT&E and O&M programs. This opportunity, though, like many others for older radar programs, is restricted.

While $156.2 million in RDT&E funding is forecast in support of F-15 radar enhancement from 2021 through 2030, giving the appearance of a somewhat lucrative source of income, an estimated 80 percent of that is destined to support ongoing enhancements to the APG-82. At most, only 20 percent of funding is allocated to APG-63 development. Still, even this limited funding may lead to small numbers of radar upgrades, which would be enacted through O&M / upgrade funding.

The F-15 Suite 8E configuration, which incorporates enhancements to the APG-82, is now mature and fielded. Some of the improvements in the Suite 8E package have been ported to the APG-63(V)3, and this effort resulted in the F-15 Suite 9E package, the initial fielding of which is in progress. While it is unlikely, perhaps additional investment in the APG-82 will pave the way for further APG-63 improvements.

APG-63(V)

Ten-Year Outlook

ESTIMATED CALENDAR YEAR O&M FUNDING (in millions US$)												
Designation or Program	**High Confidence**					**Good Confidence**			**Speculative**			
	Thru 2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
MFR Varies												
APG-63 3 <> United States <> Air Force <> F-15 A/B/C/D <> Common Configuration Program												
	8.63	1.99	1.05	.12	.00	.00	.00	.00	.00	.00	.00	3.16
Total	8.63	1.99	1.05	.12	.00	.00	.00	.00	.00	.00	.00	3.16

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions US$)												
Designation or Program	**High Confidence**					**Good Confidence**			**Speculative**			
	Thru 2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Boeing Defense, Space & Security												
F-15 APG-63(V)3 & APG-82 - EP & Other Radar Enhancements <> United States <> Air Force <> F-15 C/D/E												
	343.20	72.03	30.62	18.04	5.01	2.37	2.10	3.22	5.69	9.49	7.58	156.15
Total	343.20	72.03	30.62	18.04	5.01	2.37	2.10	3.22	5.69	9.49	7.58	156.15