Program Briefing

The F-15 Eagle is a twin-engine, single-seat, fixed-swept-wing, all-weather, air superiority fighter aircraft and, as the F-15E Strike Eagle, a dual-role, twin-seat, long-range interdiction fighter. The prime manufacturer of the aircraft is Boeing, formerly McDonnell Aircraft Co.

US F-15 procurement was terminated in FY91, but was re-instated for a few extra years, allowing for a total USAF buy of 236 F-15Es. The F-15 is in service with the US Air Force (USAF), Saudi Arabia, Israel, and Japan, where the aircraft was license-built by Mitsubishi. South Korea has also ordered the F-15K, while Singapore has opted for the closely related F-15SG and Qatar for the even newer QA.

Over 1,700 F-15s have been delivered.

Recent News

USAF Procurement Restart

After a multi-decade absence, F-15s re-appeared in the USAF FY20 budget request. The service is buying the F-15EX, a close cousin of the F-15QA being built for Qatar. It could ultimately get up to 144 of these. The request for six was fully funded in the FY20 budget deliberations in Congress, with 12 more in the FY21 request.

Executive

Dept. of the Air Force
US Air Force Systems Command
Aeronautical Systems Div.
Wright-Patterson Air Force Base
Dayton, OH 45433
(513) 255-6151
www.afmc-pub.wpafb.af.mil

Manufacturer

The Boeing Co.
McDonnell Aircraft and Missile Systems
Box 516
St. Louis, MO 63166
(314) 234-3141
www.boeing.com
Subsystems

Airframe

The F-15 airframe includes 2% composites by fly weight. These include boron/epoxy empennage skins and a carbon fiber/epoxy speed brake.

Airframe Subcontractors

Additional subcontractors that are involved with airframe work are listed below:

- AMI Metals: steel and aluminum sheet and plate products
- Alsalam Aircraft Co: wing sets for remanufactured Saudi F-15SAs; wings, forward fuselages, pylons, adapters for new SAs
- Astech/MCI: structural components
- Cleveland Pneumatics: nose and main landing gear units
- Dorne & Margolin: DM CN18 antenna
- Fuji Heavy Industries: landing gear doors for Japanese F-15s
- GKN Aerospace: rudder, frame and fuselage sections side panels, metal and composite sub-assemblies (starting 2002); integrated canopy system (starting 2004)
- General Dynamics: wideband radomes for AESA radar modernization program
- Goodrich: horizontal aft box assemblies, flight control surfaces
- Héroux-Devtek: landing gear components; nose and main landing gear starting in 2019
- Israel Aerospace Industries: rudders, doors, vertical stabilizers, conformal fuel tanks, cockpit side panels
- Kawasaki Heavy Industries: wings and tail assembly for Japanese F-15s
- Korea Aerospace Industries: forward fuselages and wings for F-15K (and other F-15s sold after 2003 in Asia)
- Sumitomo Heavy Industries: landing gear for Japanese F-15s
- Héroux-Devtek: landing gear components; nose and main landing gear starting in 2019
- Israel Aerospace Industries: rudders, doors, vertical stabilizers, conformal fuel tanks, cockpit side panels
- Kawasaki Heavy Industries: wings and tail assembly for Japanese F-15s
- Korea Aerospace Industries: forward fuselages and wings for F-15K (and other F-15s sold after 2003 in Asia)
- Sumitomo Heavy Industries: landing gear for Japanese F-15s

Propulsion

Two Pratt & Whitney F100-PW-220 turbofans (23,770 lbf); F-15A/B/C/D; AFE option.

Two Pratt & Whitney F100-PW-229 turbofans (29,100 lbf); IPE competitor.

Two General Electric F110-GE-129A turbofans (approximately 30,000 lbf); F-15K, F-15SG, and future new build/retrofit competitor.

Engine Options

As part of its Improved Performance Engine (IPE) program for the F-15E (as well as future F-16s; see report), the USAF began installing Pratt & Whitney F110-PW-229 engines in F-15Es starting in 1991. Some early USAF F-15s with old F100s have gotten retrofit kits, bringing their engines to F100-220E (E = Equivalent) standard. Japan has already begun this program.

An F-15E flew for the first time with a General Electric F110-GE-129 engine in early July 1989, at the company’s plant in St. Louis, MO. Qualification testing ended after 1989, but were restarted in 1997. South Korea and Singapore have selected the GE engine for their new F-15s, while Saudi Arabia is re-engineing 70 of its F-15Ss with F110s. Only the F-15E and related models can be fitted with the GE engine.

Of the 226 F-15Es built before the FY2000/2001 buys, 125 have the Pratt engine, while 101 have the GE engine.

In late 2019 and early 2020 the Air Force effectively selected the GE-129 engine as the sole-source powerplant for the F-15EX. However, in May 2020 the service asked for proposals from both manufacturers. The first batch of F-15EXs, however, will use GE engines. That contract covers 16 installed F110s and three spares.

Propulsion System Subcontractors

Additional subcontractors that are involved with aspects of the propulsion system are listed below:

- Hamilton Sundstrand: EEC-90 engine control system
- Honeywell (Bendix): engine fuel controls
- Honeywell (Garrett): jet fuel starter
- Ishikawajima-Harima Heavy Industries: F100 license production for Japanese F-15s
- Samsung Techwin: F110 license production (78 engines) for Korean F-15Ks

Electronics

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Note</th>
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<tbody>
<tr>
<td>AN/APX-101(v)</td>
<td>IFF transponder</td>
<td>Toyo Communication Equipment</td>
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<td>AN/APX-76A(v)</td>
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<td>AN/APX-113</td>
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<td>RoK F-15K</td>
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<td>AN/APX-164</td>
<td>UHF Transceiver</td>
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<td>F-15 MSIP, F-15E Strike Eagle</td>
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<td>KY-58</td>
<td>secure voice control</td>
<td>Honeywell</td>
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<td><strong>Displays &amp; Instrumentation</strong></td>
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<td>Tokyo Keiki Co.</td>
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<td>DASH</td>
<td>display and sight helmet system</td>
<td>Elbit</td>
<td>F-15I</td>
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<td>F-15QA</td>
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<td>flat panel color displays</td>
<td>Kaiser Electronics</td>
<td>F-15E after 2000; also F-15K</td>
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<td>n/a</td>
<td>moving map display</td>
<td>Honeywell</td>
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<td>Hercules Aerospace Display Systems, Inc.</td>
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<td>AN/ALQ-128</td>
<td>threat warning receiver</td>
<td>Magnavox</td>
<td>standard with TESW</td>
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<td>BAE Systems</td>
<td>-56C on MSIP, E, and K</td>
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<td>AN/ALE-45</td>
<td>countermeasure dispenser</td>
<td>BAE Systems (Tracor)</td>
<td>F-15 MSIP, F-15E Strike Eagle</td>
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<td>AN/ALE-47</td>
<td>chaff and flare dispenser</td>
<td>BAE Systems</td>
<td>RoK F-15K</td>
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<td>AN/ALQ-119</td>
<td>ECM pod</td>
<td>Northrop Grumman (Westinghouse)</td>
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<td>AN/ALQ-127</td>
<td>tail receiver/jammer</td>
<td>General Electric</td>
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<td>AN/ALQ-135</td>
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<td>Northrop Grumman</td>
<td>F-15E/K</td>
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<td>BOL</td>
<td>countermeasures dispensers (DEWS/Common Missile Warning Systems (CMWS))</td>
<td>Saab Avionics</td>
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<td>n/a</td>
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<td>BAE Systems</td>
<td>Added to Saudi F-15S fleet starting 2012</td>
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<tr>
<td>EL/L-8222</td>
<td>ECM pod</td>
<td>IAI Elta</td>
<td>Israeli AUP F-15s</td>
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<td>XJ/APQ-1</td>
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<td>Mitsubishi Electric</td>
<td>for JASDF F-15J</td>
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<td>SPS-2110</td>
<td>self-protection system</td>
<td>Elissa</td>
<td>F-15I, F-15SG</td>
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<tr>
<td>ADCP</td>
<td>Advanced Display Core Processor</td>
<td>Honeywell</td>
<td>RoK F-15K</td>
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<td>ARC-12</td>
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<td>Hamilton Sundstrand</td>
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<td>AN/APX-76</td>
<td>IFF interrogator</td>
<td>BAE Systems (Hazeltine)</td>
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<td>AN/ASK-6</td>
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<td>Unisys</td>
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<td>CP-1075</td>
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<td>CP-1075</td>
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<td>AN/APX-101</td>
<td>Teledyne Electronics</td>
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<td>video recorders</td>
<td>Photo-Sonics</td>
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<td>VHSIC CC</td>
<td>Lockheed Martin</td>
<td>F-15E Strike Eagle</td>
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<td>n/a</td>
<td>airborne video tape recorder</td>
<td>TEAC</td>
<td>license-built for Japanese aircraft</td>
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</table>
**Boeing F-15 Eagle**

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<tr>
<th>N/A</th>
<th>auto. analog flight control system</th>
<th>General Electric</th>
<th>All versions except F-15E F-15E Strike Eagle</th>
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<td>N/A</td>
<td>digital flight control system</td>
<td>Lear Siegler Astronics</td>
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<tr>
<td>N/A</td>
<td>data transfer unit</td>
<td>RADA Electronic Industries</td>
<td></td>
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</tbody>
</table>

**Navigation**

| AN/ARN-111   | TACAN                      | Gould                |                                        |
| AN/ARN-112   | ILS Receiver               | Rockwell Collins    |                                        |
| AN/ARN-118(v) | Tacan unit                | Nippon Electric Co. |                                        |
| AN/ASN-109   | inertial navigation system | Toshiba Corp.       |                                        |
| H-770        | ring laser gyro INS        | Honeywell            |                                        |
| LN-94        | ring laser gyro INS        | Honeywell            |                                        |
| N/A          | air navigation indicator   | Honeywell            |                                        |
| N/A          | miniature airborne GPS receiver | Rockwell Collins   | F-15E                                    |

**Sensors**

| LN-94  | ring laser gyro INS | Honeywell          |                               |
| DB-110 | long range oblique photography pods | Goodrich             | Saudi F-15SAs and Ss for retrofit |
| AN/APG-63 | multi-mode fire control radar | Mitsubishi Electric Corp. | license-built for Japanese aircraft |
| AN/APG-70 | multi-mode radar | Raytheon (Hughes) | F-15E, F-15J retrofit |
| AN/APG-82 | AESA radar | Raytheon            | F-15K; for retrofit to some USAF C/Ds |
| ANS-42   | infrared search and track pod | Lockheed Martin | terrain-following radar for LANTIRN |
| N/A     | LANTIRN Radar          | Raytheon (TI)       |                                        |

**Weapons Control/Targeting**

| AAS-42 Tiger Eye | infrared search and track pod | Lockheed Martin | ReK F-15K/SG; Saudi F-15SA |
| AN/AAQ-14       | LANTIRN Targeting Pod       | Lockheed Martin | F-15E |
| AN/AAQ-33       | Sniper Advanced Targeting Pod | Lockheed Martin | F-15G |
| AN/AWG-27       | armament control system     | Komatsu          | Japanese F-15s |
| CN-1377/AWG     | lead computing gyro         | Toshiba Corp.    | license-built for Japanese aircraft |
| N/A             | helmet-mounted site         | Elbit             | F-15I |

**Weapon Systems**

**F-15A/B/C/D**

The F-15 Eagle is armed with a Lockheed Martin 20mm M61A1 six-barrel cannon with 940 rounds of ammunition. Air-to-air missile (AAM) options include four Raytheon AIM-9 (including AIM-9X) Sidewinder and four AIM-7 Sparrow AAMS, or eight AIM-120 AMRAAMS. The missiles can be launched from wingtip launch systems or from centerline pylons, or from stores carriers on the conformal fuel tanks.

Other missile options, being added or already available, include Mitsubishi’s AAM-3s with NEC seekers, and AAM-4s (with the AAM-4B and AAM-5 added under the F-15MJ upgrade), and Israel’s Python.

Air-to-ground weapons can be carried on three stations (two underwing, one centerline), or five if the conformal fuel tanks (CFT) are attached.

Israeli F-15s are being upgraded to carry Rafael AGM-142D Popeye TV/IR-guided AGMSs.

**F-15E**

By design, the F-15E has tremendous air-to-ground weapon enhancements over the F-15 without losing its air-to-air capabilities. The AAM carriage capability is identical between the two, but the F-15E’s ground attack stores are different. The F-15E can be rigged with either single or triple rail launchers underwing for AGM-65 Maverick missiles. The CFTs also can carry up to six bomb racks each. Triple ejector racks also are available for underwing or centerline carriage. The LANTIRN system is used for AGM-130 standoff bombs, and AGM-88 HARMs were added in 1996. The F-15E can carry nuclear weapons as well (but not cruise missiles). In June 2020 the E was qualified to carry the B61-12, the latest variant of the B61 nuclear bomb.

Various new smart weapons are being added to the F-15E, starting in 2000. The first was Raytheon’s EGBU-15. Others will include Raytheon’s JSOW, Lockheed Martin’s WCMD, and Boeing’s JDAM. The GBU-39 Small Diameter Bomb will be added, starting in late 2006. The F-15K is the first Eagle that can carry Boeing’s Harpoon anti-ship missile. In February 2004 the F-15 made its first flight with the AGM-84 SLAM-
ER, which will also equip the F-15K. In 2020, Raytheon’s StormBreaker PGM was added.

In July 2012 integration was completed of Lockheed Martin’s AGM-158 Joint Air-Surface Standoff Missile (JASSM) on the F-15E. The ER variant achieved full operational capability on the platform in February 2018.

In June 2013 South Korea selected Taurus Systems’ Taurus KEPD cruise missile for its F-15K.

EDO Corp., College Point, MD, produces bomb release units for the F-15E. TAAS-Israel (formerly Israel Military Industries) produces centerline pylons. For Japanese F-15s, Nippi produces pylons and missile launchers, while Shin Meiwa produces drop tanks.

Other Systems

Conformal Fuel Tanks

The key to the later model F-15C/D/E’s capability to operate at long ranges is conformal fuel tanks (CFT). The tanks, installation of which can be completed in approximately 15 minutes, are attached to the aircraft’s engine air intakes, and each can provide the aircraft with an additional 4,875 lb. of fuel. The tanks also can be configured to carry a wide range of avionics and sensor equipment, as well as stores stations, without affecting the carriage of other systems and weapons. In addition, the aircraft can take advantage of up to three 610-gal (2,309-l) external fuel tanks.

Additional Contractors

Further subcontractors involved with miscellaneous subsystems are as follows:

- Abex: engine driven pumps
- Advanced Electronics Company: parts for electronics systems
- BAE Systems: rudder feel control actuators
- Dowty: rudder actuators
- Ducommun (MechTronics): electromechanical enclosures and systems for Raytheon on APG-63
- Dynasciences Corp: windshield anti-icing valve
- Electro Development Corp: transformer-rectifiers for power generating system
- Goodyear: nose wheel and tire (all models except F-15E), internal fuel tanks
- Hamilton Sundstrand: air inlet controllers, generator constant speed drive units, LANTIRN environmental control system
- Honeywell (Bendix Wheels and Brakes): main wheels and brakes (all models), nose wheel (F-15E)
- Honeywell (Garrett): auxiliary power unit
- Hydraulic Research and Manufacturing Company: modular hydraulic packages
- Hydro-Aire: wheel braking skid control unit
- Litton Life Support: MSOGS/OBOGS
- Lucas Aerospace: electrical power generating system
- Michelin: AIR X radial tires (F-15E)
- Moog: flight controls
- National Water Lift: air inlet actuators, hydraulic actuators for ailerons and tailplane
- Ronson Hydraulic Units: hydraulic actuators for rudders
- Saab Avionics: BOL countermeasure dispensers
- Sargent-Fletcher: external fuel tanks
- Signal Technology: power supply for radar warning receiver
- Simmonds: fuel gauge system, liquid oxygen indicator
- Smiths Industries: power generating system
- Universal Propulsion Company: aircrew escape system components
- Weber Aircraft (now Boeing): Advanced Concept Ejection Seats (ACES)

Specifications

|                     | F-15
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<tr>
<td>Length (overall)</td>
<td>63 ft 9 in (19.1 m)</td>
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<tr>
<td>Height (overall)</td>
<td>18 ft 6 in (5.5 m)</td>
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<tr>
<td>Wingspan</td>
<td>42 ft 10 in (12.8 m)</td>
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<tr>
<td>Wing area</td>
<td>608 sq ft (56.5 sq m)</td>
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<tr>
<td>Empty weight (F-15C/D)</td>
<td>28,200 lb (12,790 kg)</td>
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<tr>
<td>Empty weight (F-15E):</td>
<td>32,000 lb (14,515 kg)</td>
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<tr>
<td>Max. T-O weight (F-15C/D) w/CFT:</td>
<td>68,000 lb (30,600 lb)</td>
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<tr>
<td>Max. T-O weight (F-15C/D) w/ext. tanks:</td>
<td>58,470 lb (26,521 kg)</td>
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<td>Max. T-O weight (F-15E):</td>
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<td>Ferry range (w/CFT):</td>
<td>3,560 mi (5,696 km)</td>
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<tr>
<td>Ferry range (w/ext. tanks):</td>
<td>2,878 mi (4,604 km)</td>
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Costs

USAF
The last unit price paid by the USAF for an F-15E was $75 million, for the proposed FY01 buy.
Under the original FY90 budget request unit cost for the F-15E was $37.1 million, but appropriated funding for FY90 shows a unit cost of $36.7 million. The FY91 request shows a unit price of $50.4 million, the increase reflecting, in part, termination costs. Flyaway cost for the F-15E was $35 million. The 18-unit FY96-98 buy had a unit cost of $55 million, and FY98 requested unit cost was $53 million. For FMS buys, see Funding History, below.
The F-15S/MTD demonstrator cost $117.8 million under an October 1984 cost-sharing contract.
The latest DoD SAR cost estimate (Dec. r 31, 2017) states total F-15EPAWSS program costs as $2.995 billion (current year dollars) or $2.596 billion (FY16 base year dollars) for 221 upgrades.

Exports
FY90 flyaway costs for Mitsubishi-built F-15s were $55.2 million. FY95 unit cost for five Mitsubishi-built F-15s (requested) is $115.3 million. FY96 unit cost for four F-15DJs is $116.8 million.
The F-15S/MTD demonstrator cost $117.8 million under an October 1984 cost-sharing contract.
The unit cost for the first lot of 40 F-15K airframes and engines (flyaway cost) was $75.3 billion won ($84.4 million). This rose to $87.66 billion won for the second lot of 20, according to a Korean National Assembly document. US records indicated a $3.6 billion program cost for the first 40 aircraft, with a program unit cost of $90 million. Currency fluctuations may account for the discrepancy. And these sums (for the 40 aircraft) were in 2002 dollars, so program unit cost would be around $115 million in today’s money.
Israel paid $1.76 billion for its 21 F-15Is acquired in 1993. In December 2005 Singapore signed for 12 F-15SGs, with AESA radars. The value of this deal was given as $1.6 billion, a program unit cost of $133 million.
Boeing’s recent 84-aircraft F-15 sale to Saudi Arabia was valued at $11.4 billion (program cost) implying a program unit cost of $135.7 million.

Sales/Deliveries Data

Deliveries

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<th>Year</th>
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Order Book

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<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td>F-15A/B</td>
<td>21/21</td>
<td>25 more ex-US aircraft delivered</td>
</tr>
<tr>
<td>Israel</td>
<td>F-15C</td>
<td>18/18</td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>F-15D</td>
<td>13/13</td>
<td>10 more ex-US aircraft</td>
</tr>
<tr>
<td>Israel</td>
<td>F-15I</td>
<td>25/25</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>F-15J</td>
<td>165/165</td>
<td>all but 2 license-built</td>
</tr>
<tr>
<td>Japan</td>
<td>F-15DJ</td>
<td>48/48</td>
<td>all but 12 license-built</td>
</tr>
<tr>
<td>Qatar</td>
<td>F-15QAA</td>
<td>48/—</td>
<td>72 possible</td>
</tr>
</tbody>
</table>
### Contract Briefs

The following is a listing of contract announcements made by the Pentagon involving the award of, or modification to, unclassified prime contracts with a base value of $7 million or more for a period of one year prior to the date at the end of this report.

<table>
<thead>
<tr>
<th>Date</th>
<th>Contract Number</th>
<th>Agency</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/31/2019</td>
<td>FA8730-16-C-0019</td>
<td>$57,806,293</td>
<td>modification to a previously awarded contract action issued by the Air Force Life Cycle Management Center - Hanscom for the Royal Saudi Air Force F-15SA Cyber Protection System and Related Facilities program. This modification provides for the construction of a secure communication facility at the Royal Saudi Air Force (RSAF) Headquarters. The contract is scheduled to be completed by 7/31/2022. Program involvement: F-15.</td>
</tr>
<tr>
<td>12/20/2019</td>
<td>FA8730-16-C-0019</td>
<td>$13,704,09</td>
<td>modification to a previously awarded contract action issued by the Air Force Life Cycle Management Center - Hanscom for the Royal Saudi Air Force F-15SA Cyber Protection System and related facilities program. This modification provides for Build 2 of the Cyber Protection System. The scope of this contract effort will include the deployment of a Cyber Security Operations Center at Prince Sultan Air Base, the establishment of End Point Security (data at rest encryption using MS BitLocker), and additional System Integration Lab Instances. The contract is scheduled to be completed by 12/31/2020. Program involvement: F-15.</td>
</tr>
<tr>
<td>01/10/2020</td>
<td>FA8730-16-C-0019</td>
<td>$17,022,427</td>
<td>cost-plus-fixed-fee, cost reimbursable modification to a previously awarded contract action issued by the Air Force Life Cycle Management Center - Hanscom for the Royal Saudi Air Force (RSAF) F-15SA Cyber Protection System (CPS) and Related Facilities program. This modification provides for three years of in-Kingdom Contractor Logistics Support (CLS) for the CPS. The scope of this contract effort will include the extension of existing CLS support for three additional years, as well as related mobilization, demobilization, transportation and housing expenses for CLS personnel. The contract is scheduled to be completed by 5/31/2022. Program involvement: F-15.</td>
</tr>
<tr>
<td>06/23/2020</td>
<td>FA8730-16-C-0019</td>
<td>$12,374,760</td>
<td>firm-fixed-price and cost-reimbursable modification contract action issued by the Air Force Life Cycle Management Center - Hanscom 0019 for the Royal Saudi Air Force (RSAF) F-15SA Cyber Protection System (CPS) and Related Facilities program. This modification provides for implementation and delivery of end-user training for the CPS for two years. The scope of this contract effort will include custom contractor-developed training and original equipment manufacturer training. The contract is scheduled to be completed by 6/1/2022. Program involvement: F-15.</td>
</tr>
</tbody>
</table>

**Advanced Electronics**

**Aptiv Services 3 US**

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Boeing, Defense, Space & Security - Strike, Surveillance & Mobility

07/29/2019  FA8634-17-F-0002  $10,395,313  firm-fixed-price and cost-plus-fixed-fee modification to a previously awarded delivery order contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for F-15 Advanced Display Core Processor (ADCP) II low-rate initial production Lot 1. This engineering change proposal provides for the production and integration of the ADCP II boxes and related equipment into the F-15 platform. The contract is scheduled to be completed by 7/31/2021. Program involvement: F-15. RDT&E involvement: 0207134F.

08/28/2019  FA3002-19-D-A007  $262,147,569  increment as part of a not-to-exceed $500,000,000, firm-fixed-price, indefinite-delivery/indefinite-quantity single award contract action issued by the 42nd Contracting Squadron or Qatar Emiri Air Force (QAEF) F-15QA aircrew and maintenance training. This contract will provide F-15QA aircrew and maintenance training to support the QEAF. Work will be performed in St. Louis, MO. The contract is scheduled to be completed by 8/31/2026. Program involvement: F-15.

09/19/2019  FA3002-13-D-0012  $156,911,600  indefinite-delivery/indefinite-quantity bilateral modification to a previously awarded contract action issued by the 42nd Contracting Squadron for the Foreign Military Sales (FMS) Royal Saudi Air Force (RSAF) F-15SA Original Equipment Manufacturer Training Program. Work will be performed at King Khalid Air Base, Khamis Mushayt; King Faisal Air Base, Tabuk; and King Abdul Aziz Air Base, Dhahran, Kingdom of Saudi Arabia. The contract is scheduled to be completed by 12/31/2021. Program involvement: F-15.

09/24/2019  FA8621-15-C-6397  $22,656,895  modification to a previously awarded contract action issued by the Air Force Life Cycle Management Center - Wright-Patterson for F-15C and F-15E Mission Training Center. The contract modification is for implementation of Suite 9.1/Eagle Passive Active Warning Survivability System (EPAWSS) into F-15C and F-15E MTCs to update F-15 MTCs with Suite 9.1 and add EPAWSS capabilities to the F-15E MTC simulators. Work will be performed in Seymour Johnson AFB, NC; Mountain Home AFB, ID; Nellis AFB, NV; and 2 other locations. The contract is scheduled to be completed by 9/23/2021. Program involvement: F-15, EPAWSS.

09/27/2019  FA8634-17-D-2696  $12,157,659  increment as part of a $13,420,210 firm fixed price, cost plus fixed fee contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for F-15 Non-ADCP II Video Situational Display Replacement (NA-VSDR) program. This contract provides for the production and integration of the NA-VSDR units and related equipment into the F-15 Air National Guard platform. The contract is scheduled to be completed by 6/30/2023. Program involvement: F-15.

01/30/2020  FA8634-18-C-2698  $84,108,947  modification to a previously awarded contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for the F-15 Advanced Display Core Processor (ADCP) II Low-Rate Initial Production 4. This contract modification exercises an option that provides the production and integration of the ADCP II boxes and related equipment into the F-15 platform. The contract is scheduled to be completed by 7/22/2022. Program involvement: F-15, ADCP.

03/31/2020  FA8634-18-C-2698  $8,168,444  modification to a $274,094,703 fixed-price incentive, firm-fixed-price, cost-plus-fixed-fee contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for the F-15 Advanced Display Core Processor II (ADCP II) Low-Rate Initial Production 4. This contract modification exercises an option that provides the installation and environmental control system repair of the ADCP II boxes and related equipment into the F-15 platform. Work will be performed in Naval Air Station New Orleans, LA. The contract is scheduled to be completed by 9/30/2022. Program involvement: F-15, ADCP.

04/01/2020  FA8621-16-C-6397  $11,083,286  firm-fixed-price modification contract action issued by the Air Force Life Cycle Management Center - Wright-Patterson for F-15C and F-15E Mission Training Centers (MTC) services on contractor furnished, high-fidelity simulation equipment. Contractor will provide the simulation capability to train pilots and weapons system operators for F-15C and F-15E aircraft platforms. Work will be performed at Seymour Johnson AFB, NC; Mountain Home AFB, ID; Langley AFB, VA; Kadena Air Base, Japan; and Royal Air Force, Lakenheath, England. The contract is scheduled to be completed by 12/31/2020. Program involvement: F-15.

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04/06/2020  FA8634-18-C-2701  $33,349,400  increment as part of a $68,060,000 undefinitized contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for the F-15 Qatar program. This contract action supports the Foreign Military Sales requirement for the Qatar Emiri Air Force and provides maintenance and logistics support for aircraft and training devices conducting pre-delivery training. The contract is scheduled to be completed by 12/21/2020. Program involvement: F-15.

06/16/2020  FA8621-17-C-6398  $22,665,000  firm-fixed-price modification contract action issued by the Air Force Life Cycle Management Center - Wright-Patterson for F-15SA aircrew training devices (ATD). The contract modification provides for the purchase and installation of a full mission trainer (FMT), a visual database for the area of King Khalid Air Base, Saudi Arabia, and five years of contractor logistics support for existing ATDs. Work will be performed in St. Louis, MO; King Faisal Air Base; and King Khalid Air Base. The contract is scheduled to be completed by 4/30/2024. Program involvement: F-15.

07/13/2020  FA8634-20-D-2704  $53,000,000  increment as part of a $22,890,000,000 indefinite-delivery/indefinite-quantity contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for the F-15EX system. Work will be performed in St. Louis, MO; and Eglin AFB, FL. The contract is scheduled to be completed by 12/31/2023. Program involvement: F-15. RDT&E involvement: 0207134F.

CAE USA, Mission Solutions

03/03/2020  FA4890-17-C-0006  $10,586,540  firm-fixed-price modification contract action issued by the Air Combat Command, Acquisition Management & Integration Center for the F-15E, F-16 and F-22A contract aircrew training and courseware development contract. The performance locations are as follows: Langley Air Force Base (AFB), VA; Seymour Johnson AFB, NC; Shaw AFB, SC; Tyndall AFB, FL; Nellis AFB, NV; Hill AFB, UT; and Mountain Home AFB, ID. The contract is scheduled to be completed by 3/31/2021. Program involvement: F-15, F-16, F-22.

Crane Electronics

09/23/2019  SPRWA1-19-D-0010  $9,283,185  fixed-price, requirements contract action issued by the Defense Logistics Agency - Aviation for AN/ALR-56 radar warning receiver low voltage power supplies in support of the F-15 aircraft. Work will be performed in Florida. The contract is scheduled to be completed by 9/18/2024. Program involvement: AN/ALR-56, F-15.

Honeywell International

08/20/2020  FA8538-20-D-0010  $1,299,869  increment as part of a $20,798,038 indefinite-delivery/indefinite-quantity contract action issued by the Air Force Sustainment Center - Robbins for the repair of the advanced display core processor (ADCP) and digital mapping service (DMS) in F-15Es. Work will be performed in Robbins AFB, GA; and Phoenix, AZ. The contract is scheduled to be completed by 8/19/2025. Program involvement: F-15.

Pacific Consolidated Industries


Tapestry Solutions

02/25/2020  FA8730-20-C-0001  $387,876  increment as part of a $28,390,620 contract action issued by the Air Force Life Cycle Management Center - Hanscom for F-15 mission planning software development and maintenance. This contract provides for the F-15 software development of the v6.1 Mission Planning Environment and supports the F-15 Organizational Flight Program Suite 9.1 through sustainment of the previously-fielded v5.0 Mission Planning Environment for the Air Force and foreign country specific releases for the foreign military sales (FMS) client nations as well as the in-test v6.0 Mission Planning Environment. The foreign military sales effort allows continued support to incorporate requirements to provide country specific versions of Air Force Mission Planning Environment updates in accordance with each country specific FMS Letters of Acceptance between the U.S. government and the foreign government. The Mission Planning Environment updates will be

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Boeing F-15 Eagle

Program Overview

History

Origins

McDonnell Douglas was chosen in 1969 over North American Rockwell and Fairchild as the winner of the FX competition to develop a new USAF air superiority fighter. McDonnell had started work on the design after the FX program was initiated, in April 1965. There was no competitive fly-off.

In March 1970 the Air Force chose Pratt & Whitney for the engine contract. McAir received a contract for 20 test aircraft, 18 of these being single-seat F-15A and two being twin-seat TF-15A training variants. The first flight of the aircraft, an F-15A, took place on July 27, 1972, while the TF-15A flew for the first time on July 7, 1973. The twin-seat versions were later re-designated F-15B.

The F-15 long lead production decision was made in October 1972, and the full production decision was made in February 1973. The first operational F-15A was delivered in November 1974. Initial operating capability (IOC) was reached in July 1975. Total production came to 365 F-15As, including 10 YF-15As, and 59 F-15Bs, including two YF-15Bs.

F-15C/D

Starting in June 1979, production for the USAF switched to the F-15C/D versions (the D referring to

United Technologies, Pratt & Whitney

09/26/2019 FA8604-19-D-8005 $1,050,000

Increment as part of a $19,755,926 firm-fixed-price and cost reimbursable contract action issued by the Air Force Life Cycle Management Center - Wright-Patterson for contractor engineering and technical services in support of the F100-PW-100/200/220E/229 engines for the F-15 and F-16 aircraft. Work will include Air National Guard support in Tucson, AZ; Toledo, OH; New Orleans, LA; and Foreign Military Sales support in Egypt, Greece, Indonesia, Iraq, Jordan, Republic of Korea, Morocco, Pakistan, Taiwan, and Thailand. The contract is scheduled to be completed by 3/15/2023. Program involvement: F-15, RDT&E involvement: 0208006F.


Universal Propulsion

03/31/2020 FA8213-20-D-0006 $1,016,393


University of Dayton, Research Institute

07/03/2019 FA8505-19-D-0003 $2,464,648

Increment as part of a $28,527,970 firm-fixed-price, labor hour and cost reimbursement-no-fee contract action issued by the Air Force Life Cycle Management Center - Fighter/Bomber Directorate, F-15 Division for F-15 sustainment engineering studies. This contract provides for systems/structural engineering field and programmed depot maintenance support, reliability and maintainability analysis and aircraft structural integrity program capability development and sustainment. Work will be performed in Dayton, OH; and Robins AFB, GA. The contract is scheduled to be completed by 6/28/2020. Program involvement: F-15.
the two-seat operational training variant). The F-15C flew for the first
time on Feb. 26, 1979, while the F-
15D flew for the first time on June

The major modification to the F-
15 for the F-15C/D versions was the
addition of the conformal fuel tanks
(see Weapon Systems above). In later
F-15C/Ds, improvements also were
made to the aircraft’s radar to im-
prove its performance during heavy
raids, enabling the radar to better as-
sess and identify targets. The modifi-
cation, a programmable signal pro-
cessor with an expanded mission
computer, was retrofitted to older air-
craft.

F-15E Requirement
The F-15E was at first an industry
designed aircraft. McDonnell Dou-
glas initiated the series of modifica-
tions to an F-15B in early 1980 to
produce an all-weather long-range
strike aircraft. The USAF in 1984
chose this new aircraft, the F-15E,
also known as the Strike Eagle, over
the F-16XL to fulfill its Dual Role
Fighter requirement and replace the
General Dynamics F-111 in the long-
range interdiction role. The first F-
15E was delivered to the USAF in
1988, and the aircraft was expected to
reach initial operating capability
(IOC) in 1989.

F-15E System Description
The major modifications to the F-
15 for the F-15E include the addition
of a second seat and the associated
systems, a digital flight control sys-
tem, the redesign of up to 60% of the
aircraft’s airframe, the addition of
LANTIRN (Low Altitude, Naviga-
tion, Targeting and Infrared for
Night) capability, automatic terrain
following systems, and the new
AN/APG-70 radar with synthetic ap-
erture. Internal fuel capacity has been
reduced, but the ability to carry large
amounts of deliverable weapons has
been maintained, especially through
the use of the CFT.

The rear pilot has at his disposal
four CRT displays: radar, FLIR, digi-
tal mapping, and threat warning. The
front pilot has a lone head-up display.
Also, the engine bay is modified to
accommodate both General Electric
and Pratt & Whitney versions of the
IPE options (although as of 2001 no
customers have selected GE engines.

In addition, the aircraft’s central
computer has been upgraded (with
increased memory) so it may handle
more data and process it faster; the
aircraft’s old armament system con-
trol panel has been replaced by a pro-
grammable Sperry full-color multi-
purpose system, which, with the new
computer, has the capability of han-
dling new versions of current AAMs,
including AMRAAM; a tactical elec-
tronic warfare system (TEWS) has
been integrated, which includes
Northrop Grumman’s AN/ALQ-135
ECM, a Loral (now Lockheed Mar-
tin) AN/ALR-56C radar warning re-
ceiver, a Tracor (now BAE)
AN/ALE-45 chaff dispenser, and a
Magnavox AN/ALQ-128 threat
warning receiver.

F-15 Terminated After FY91
Procurement of the F-15E was de-
clared terminated after FY91 in the
FY90/91 amended budget request.
The original units requested at 36
were left intact for both years, but
$103.6 million was added to the origi-
nal FY90 request of $1,235.2 mil-
ion, and $700 million was added to
the original FY91 request of $1,291.9
million, these supplements to fund
the increased costs of FY91 aircraft,
line shutdown, support and training
equipment, and technical data.

This move temporarily ended F-
15E procurement at 200 aircraft, with
another six aircraft financed by an
FY91 sale of used USAF F-15s to
Saudi Arabia and three more pro-
vided in the FY92 Desert Storm sup-
plemental weapons buy.

F-15F And U: Two Proposals
McDonnell Douglas announced
the development of an export version
of the F-15, known as the F-15F, in
January 1990. Aware that the US
DoD would probably not permit ex-
port of F-15E technology, McDon-
nell concentrated instead on incorpo-
rating some of the aerodynamic
changes of the E model into a new
single-seat air superiority version.
While privately funded by the com-
pany, the USAF encouraged de-
velopment of the F, fearful of being re-
duced to only one active fighter pro-
duction line (F-16) in a few years.

In September 1994, McDonnell
proposed a new version of the F-15E
with thicker, trapezoidal wings. The
target customer for the new vari-
ient—called F-15U—was the United
Arab Emirates, but the UAE rejected
the proposal, as did the USAF.

USAF Gets More F-15Es,
Courtesy of Congress
In 1995, the USAF decided to buy
17 more F-15Es at about $55 million
per plane. Unfortunately, the service
said it could not find the cash for
these aircraft, and was hoping Con-
gress could provide some. The De-
Fense Appropriations Conference
obliged, and inserted $311.2 million
for six aircraft in the FY96 budget.
The contract for these was signed in
May 1996. The Conference also
added $50.2 million for advance pro-
curement, and more in FY97—
$275.4 million for six aircraft.

Congressional F-15 plus-ups also
featured in the FY00 and 2001 budg-
et. In 2000, Congress approved five
planes for $267 million, and in 2001
it approved money for an additional
five. However, the FY00 funding
proved insufficient to make the
planes mission capable, so an addi-
tional $90 million was added as an
emergency supplemental.

These last two batches are known
in the Air Force as the E210s and
E227s (based on their
production serial numbers). The 2000
and 2001 buys should (in theory) end
F-15E production at 236 planes.

Boeing Unveils Silent Eagle
In March 2009 Boeing unveiled
its proposed F-15SE Silent Eagle, a
new stealthy version with structural changes and other survivability improvements. The CFTs have been redesigned to allow internal carriage of AAMs, JDAMs, or SDBs. The aircraft can be rapidly reconfigured to allow traditional CFT use with external weapons carriage.

In addition, the SE’s radar signature has been reduced with coatings and treatments, and the vertical tails can be canted to improve aerodynamic efficiency and reduce weight. That feature, however, is not definite.

The Silent Eagle flight demonstrator aircraft, F-15E1, completed a successful first flight on July 8, 2010.

There are no known customers, and the program has not been firmly launched, but Boeing briefed existing F-15 users, including the USAF.

**USAF Upgrades & Modifications**

**MSIP Program**

The USAF updated early F-15 versions to keep them effective against evolving threats through a Multi-Stage Improvement Program (MSIP). This program was initiated in June 1982, and FY88 saw the completion of development of all MSIP modifications. Delivery of the first MSIP F-15 aircraft was made in June 1985. Among the enhancements being made to the aircraft are avionics changes to expand air combat identification capability, an updated electronic warfare suite, and incorporation of improved communication/identification equipment. Also, improvements are being made to enhance the secondary air-to-ground role for all F-15 versions other than the F-15E; these latter modifications are tied to development of the Strike Eagle.

**F-15 Almost A Wild Weasel/SEAD Aircraft**

The Air Force was to use the F-15C as a replacement for the F-4G in the Manned Destructive Suppression of Enemy Air Defenses (MDSEAD) role. The Wild Weasel system was developed to automatically detect, identify, locate, engage, and destroy hostile radars. The F-15E’s abilities to locate and attack ground targets, especially through the use of LANTIRN, FLIR, and new APG-70 radar, make the idea of an F-15E derivative attractive, and in mid-1992 the Air Force unveiled a nine-year, $500 million plan to upgrade McDonnell Douglas F-15Es with a Wild Weasel/SEAD capability. But in October 1993, the Air Force decided to use F-15Cs as a cost saving measure.

This program entered the demonstration/validation phase in July 1994, with the award to McDonnell of a $21 million Air Force contract. In April 1994 McDonnell selected TRW and Litton to provide their HARM targeting device, the Precision Direction Finding (PDF) unit, for this program. But in August 1994 the Air Force decided to focus its MDSEAD efforts on the F-16, and work on the F-15C was shelved.

**APG-63 (V)1/2/3/4 Radar Upgrades and Other Improvements**

In July 1997, an F-15 first flew with the upgraded Raytheon (Hughes) APG-63 (V)1 radar. This version includes some APG-70 tactical software. Production of the new radar began in September 1999. It is also available to foreign users for retrofit.

In late 1999 the Air Force also announced that a squadron of F-15Cs was being equipped with the (V)2 model. This is essentially the same as the (V)1, but with an active electronically scanned array (AESA). This AESA is related to the one used on the F/A-18E/F’s Raytheon APG-79. A total of 18 F-15Cs were fitted with the new radar, with the last three delivered in December 2000. Development costs for the (V)2 are given as $277 million, while conversions cost just under $5 million per shipset.

The (V)3 version is an improved AESA version, selected by Singapore for its F-15SGs. It takes the (V)2 and adds Transmit/Receive hardware from the APG-79 (used on the F/A-18E/F). It will also be retrofitted to up to 160 USAF F-15Cs (on top of the 18 Cs with (V)2s) and 48 additional Air National Guard F-15Cs at a rate of 6-8 per year. Seven were funded in FY07, while 16 were authorized in FY08—eight USAF, eight ANG. By FY12, 98 radars were programmed for funding through FY17.

In April 2010 Boeing rolled out the first C model upgraded with the (V)3 radar. By that time 14 ANG and 10 USAF planes were on contract. By March 2014 60 aircraft had received the new radar. In November
2015 Raytheon announced the delivery of the 200th (V)3 (counting all customers).

All USAF F-15s are also getting a fifth generation electronic warfare suite called Eagle Passive/Active Warning Survivability System (EPAWSS). This $7.6 billion program was to provide retrofits for 413 C and E models, but the FY18 budget cancelled the 196 C installations. This left 217 E installations.

As of FY15 development funding for EPAWSS was covered in a new RDT&E line, below. In October 2015 Boeing and BAE Systems were selected by the Air Force to act as contractors. In November 2016 they received a $478 million contract to begin full-scale development. EPAWSS passed its critical design review in February 2017. The FY19 R&D budget included two development systems.

**Export Status**

**Israel**

Israel’s first order for the F-15 was placed early in 1976 and covered 23 F-15As and two F-15Bs, although this was later changed to all F-15As. These were delivered by 1978. Orders for a total of 26 F-15C/Ds were placed in 1980 and 1982, and these were delivered by 1987. Israel requested five replacement F-15Ds in late 1988, and the country received 25 more F-15A/Bs from USAF inventories during the war with Iraq.

**Saudi Arabia**

Under the 1979 PEACE SUN agreement, Saudi Arabia purchased 60 F-15 fighters, 45 C versions and 15 D versions. A further two C versions were purchased in 1981. The Camp David agreements allow only 60 F-15s to be operated at one time, so the two later F-15C were stored out-of-country. All were delivered by May 1983. A 1987 follow-on order of an additional 12 was approved, for a total Saudi buy of 55 Cs and 19 Ds.

During the war with Iraq, the US Air Force transferred 24 F-15C/Ds to Saudi. In August 1991, Congress directed the Air Force to use the cash from the sale—about $615 million—to buy six F-15Es. Congress later added money for three more F-15Es for Gulf War attrition. The Air Force said it did not need the planes, and was planning to use the money for general fleet maintenance. It got them anyway.

**Japan**

As a replacement for its 220 Mitsubishi-built F-4 Phantoms, Japan decided to procure 15 Eagles. This program began with FY78 procurement of 23 aircraft. All 223 aircraft were to have been funded through FY90, but funding has been stretched out (see Funding, below), and total procurement cut to 213 aircraft (all funded through FY96). An initial 14 aircraft (2 single-seat C/J models and 12 twin-seat DJ) were purchased from McDonnell through FMS channels, and eight were CKD kits provided by McDonnell, but procurement thereafter has been from Mitsubishi Heavy Industries, the licensed producer in Japan.

Other Japanese contractors on the project are listed under Subsystems, above (Teal Group retains extensive files on Japanese F-15 contractors, and clients are encouraged to call for access to these).

**F-15 Line Saved by Saudi Sale**

In September 1992 President Bush approved the long-awaited sale of 72 F-15s to Saudi Arabia. The deal, valued at $5 billion, saved the F-15 production line from imminent shutdown.

The US agreed to sell Saudi Arabia a new variant of the F-15 known as the F-15XP (later re-designated F-15S). Based on the F-15E airframe, the F-15S has mostly F-15C/D systems. It uses the F-15E’s APG-70 radar, but this was “detuned” to APG-63 standard, and some F-15E software and ECM equipment was deleted. A total of 24 aircraft were configured for air defense and 48 for air-to-ground missions. The aircraft were to be delivered between 1995

**F-15E APG-82 Radar Upgrade**

Raytheon is also developing a (V)4 model, later re-designated APG-82 (V)1. This is another AESA version with greater capabilities than the (V)2/3, particularly with newer transmit/receive module technology. It uses some back-end processor technology from the F/A-18E/F’s APG-79 AESA. The Air Force is planning to upgrade 217 of its 222 Strike Eagles with the APG-82.

In October 2008 Boeing was awarded an SDD contract to begin work on this upgrade, known as the Radar Modernization Program (RMP). The first F-15E flew with the -82 radar in January 2011.

LRIP approval was granted in September 2011. The first LRIP contract covers six units. The second LRIP, signed in July 2012, covers 10 units. By March 2014 eight had been installed.

**New USAF C/D Longerons, IRST, Perhaps Wings**

The FY18 USAF budget request adds $7 million to start a C/D longeron replacement program. This will extend service lives into the 2030s and will cost $1 million per plane.

The budget also adds $57 million for IRSTs. The first contract for installation of Lockheed Martin’s Legion IRST pod was awarded in August 2018. Legion includes ASG-34 IRST21 sensor that is also part of the F/A-18E/F modernization program. The current plan is to install 130 pods on the fleet.

In May 2017 the Air Force announced that it was considering a re-wing program for its C/D fleet. This would add a wing with capabilities and weapons stations similar to the E model wing, but not the same wing.
and 1998, but stretch-outs delayed the final delivery until 2000. In Saudi service, the F-15S is unofficially known as the Beagle, for Bomber Eagle.

On December 23, McDonnell Douglas received a $122 million FMS contract from the USAF for long-lead items for the sale. This contract represented the first disbursement of funds for the program. The money came just in time to save the McAir production line, although about 20% of the suppliers had been dropped from the program.

The Saudi purchase put an end to months of McDonnell Douglas's begging. The company mounted a major lobbying effort under the “US Jobs Now” banner, complete with numerous press releases explaining how and where it was laying off workers. According to several arms control groups, the company exaggerated the firings to gain congressional sympathy for the sale.

Israel Buys F-15E Variants

In late 1993 the Israeli Air Force selected 21 F-15I variants of the F-15E Strike Eagle, locally designated Thunder, for the country's next fighter buy. According to Israeli and Pentagon, sources, Israel will get a better version of the F-15E than Saudi Arabia was allowed to buy last year. Cost estimate for the 21 aircraft is $1.76 billion.

In November 1995 Israel firmed up options on four more F-15Is. Israel also received used USAF Lockheed F-16s. The first Israeli F-15I flew in September 1997, and was presented to Israel in November.

Korea: Fourth Export Customer, Another Line Savior

In April 2002 the Republic of Korea became the fourth F-15 export customer, thereby saving the production line from imminent doom. After a hard-fought competition (the runner up was Dassault’s Rafale), the country ordered 40 F-15K models worth an estimated $4 billion. Deliveries began in late 2005 and were completed in October 2008.

South Korea has chosen the General Electric F110 engine, a first for the F-15, for the first 40 planes. These were license produced by Samsung Techwin, which built Pratt F100s for the country’s F-16 fleet. Korea is also getting the APG-63(V)1 (without AESA), and Lockheed Martin’s TigerEyes targeting system. The K model is also the first F-15 with a Harpoon/SLAM missile capability.

In April 2008 South Korea added 21 planes to its order, for a total of 61. The first of these flew in April 2010. The first three arrived in September 2010, and the last was delivered in April 2012. This batch uses Pratt & Whitney F100-PW-229-EEP engine.

Singapore Signs for 24, And More Covertly

In September 2005 Singapore selected the F-15SG for its A-4 replacement requirement. The order included 12 firm and eight option planes, with the firm aircraft scheduled for delivery in 2009. They also selected GE F110 engines and the APG-63 (V)3 AESA radar.

In October 2007 Singapore exercised its options and added another four firm orders, raising the total order to 24 planes.

The first five SGs arrived in Singapore in April 2010. The last of the 24 were delivered in October 2012.

From there, Singapore ordered more SGs, but it was not immediately clear how many. In August 2014, Boeing registered eight more with the FAA, and these have already been delivered. There was some evidence that another eight have been acquired, raising the total to 40. There was confirmation of this in March 2016 when Singapore announced that a second F-15 squadron had been established, and in July 2017 Boeing announced that it had completed deliveries of the last eight.

Since these had been registered on the FAA’s civil database, it isn’t clear when Boeing counted them as deliveries, or, indeed, if they are apart from the aircraft recorded in our historical deliveries numbers, earlier in this report. But they do exist.

New Saudi Deal for 84 F-15SA

In 2010 and 2011, plans for another Saudi F-15 buy began to take shape, and a firm contract was signed in December 2011. This followed a letter of agreement Defense Secretary Robert Gates had delivered to Saudi Arabia during his visit there in April. The order covers 84 aircraft valued at $11.4 billion.

The aircraft will be equipped with Raytheon’s APG-63(V)3 AESA radar and GE F110-129 turbofans. The planes also will come with Lockheed Martin’s AAS-42 TigerEye IRST, among other advanced equipment.

The F-15SA is also the first version of the Eagle with a fly-by-wire flight control system and the first with BAE System’s digital electronic warfare system (DEWS), replacing the previous Northrop Grumman ALQ-135 system.

Saudi Arabia has also signed for an upgrade package that will bring its 68 older F-15Ss to the new SA configuration. That includes new GE engines, a new BAE EW package, the same AESA radar as the SA, and the same IRST. Saudi-based AlSalam Aerospace Industries received its first contract for its work on these in July 2018.

The first new-build F-15SA made its first flight in February 2013. Deliveries were to run between 2015 and 2019. However, even though aircraft had been built, actual deliveries did not begin until December 2016, with the arrival in Saudi Arabia of two remanufactured jets and two new SAs.

Qatar Buys 36-72 F-15s

In June 2017 Qatar signed an order for 36 F-15QAAs worth an estimated $12 billion, including support,
spares, weapons, etc. The QA, or Eagle 2040C, will likely be similar to Saudi Arabia’s SA variant, but features an advanced cockpit with Elbit’s large area displays. Deliveries will begin in early 2021, and under an accelerated program all will be delivered by the end of 2022.

In 2016 Congress had approved a sale of up to 72 F-15s in an agreement valued at up to $21 billion. The additional 36 planes may still be ordered, and in May 2020 DoD notifications implied that another 12 planes had been added to the initial 36 ordered.

Foreign User Upgrades

Saudi MSIP, Re-Engining

The first Saudi upgrade program was basically the MSIP. It involved the addition of the AN/APG-70 radar, an upgraded central computer system, and replacement of the armament control system.

In mid-1998, the Saudis began an upgrade program designed to bring their F-15S fleet to almost-F-15E standard. This program provided the Saudis with weapons retrofit kits, allowing three bomb racks to be fitted to each conformal fuel tank.

In September 2007 the RSAF also announced a re-engining program that will see 70 F-15Ss getting F110 engines. Most of the work will be performed in-country. With the second batch of engines ordered in September 2008, the RSAF has ordered 156 F110s.

In April 2012 the RSAF also signed for Lockheed Martin Sniper targeting pods for its F-15Ss, along with IRSTs and new datalinks. At the same time BAE Systems was given a contract for digital electronic warfare systems (DEWS) and common missile warning systems (CMWS). All told, this new F-15S upgrade was worth over $1 billion.

Israeli Upgrades

Between 1995 and 2005 Israel upgraded about 50 F-15B/Ds through the Baz 2000 program. This added new EW suites, mission computers, GPS-based nav systems, and other features.

In 2001 Israel began production of its Avionics Upgrade Program (AUP) package for its A/B/C/D fleet. This $100 million effort gave these types greater commonality with the F-15I fleet. The upgrade was completed in 2004 and focuses on avionics and precision weapons, but not radars. It is broadly modeled on the USAF MSIP effort.

In early 2015 Israel announced that Raytheon's APG-82(V)1 AESA radar would be fitted to the F-15I fleet, although this has not happened as of mid 2018. It will also receive new weapons and updated avionics.

Japanese Upgrades

Japan has modified its F-15J fleet with engine upgrades, bringing the F100s to F100-220E (E = Equivalent) standard, with a digital engine control system. Another program, begun in 1997, involves radar and computer upgrades, bringing the APG-63 radar to (V)1 standard. The radar modification program will cost about ¥2 billion ($19.2 million) per aircraft. This upgrade also includes EW suite improvements, including an ALQ-8 ECM system.

The first modified planes were delivered in December 2000, while test flights with the upgraded radar began in 2003. The upgraded F-15Js serve as escorts for F-2 squadrons. Plans called for 26 upgrades in the current five-year budget period, with two funded in 2004 and six in 2005.

In 2007 Japan decided to convert an unknown number of F-15Js to reconnaissance duties. These use Lockheed Martin Phoenix Eye SAR pods.

Development funding for the latest upgrade began in April 2019, with a $387 million development budget (also covering the first two aircraft). As of October 2019, the program covered 98 aircraft and was worth a total of $4.5 billion.

The new upgraded model is now known as the F-15MJ Japanese Super Interceptor (JSI). This will include the APG-82(V)1 AESA radar, Advanced Display Core Processor II Mission System Computer, ALQ-239 Digital Electronic Warfare System, ARC-210 digital radio, and other support systems such as the Joint Mission Planning System. It will also likely add the AAM-4 and -5 missiles, and other improvements.

Others

In September 2019 South Korea announced plans to add the APG-82 AESA radar and the EPAWSS EW system to their fleet.

Funding History

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©Teal Group Corporation
Boeing F-15 Eagle

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Teal Group Evaluation

A Remarkable Ability To Cheat Death

The F-15 has been among the most successful US fighter programs, and one of Boeing’s most lucrative McDonnell legacy programs. The sale to Korea was hugely important. The large revenue stream attached helped justify Boeing’s McAir acquisition, and saved the company from its post-JSF loss doldrums. It also affirmed the US’s reliance on its superpower status as a way to sell weaponry.

Even better news: the F-15K, and its cousins the F-15SG and F-15E+ Super Eagle, rejuvenated the product, with new systems, weapons, and sensors. And the F-15K was not an orphan plane. It gave this veteran jet another two or three decades on the market, a fact confirmed by 2005’s Singapore victory. Both customers increased their orders, to 61 and 40, respectively.

Most recently, Qatar joined the club, taking production into the 2020s. Our forecast assumes they get 48, but they are approved for up to 72. The QA variant sets yet another high standard, paving the way for the F-15X offer to the USAF (about which more in a moment).

The reborn F-15 has been very bad news for the Rafale and Eurofighter. It’s a heavyweight strike platform that kept the high end of the market (other than Egypt, and perhaps India) largely in US hands until F-35 arrives. However, South Korea’s rejection of the Silent Eagle proposal killed that idea.

At home, there’s the very big issue of USAF F-15EX procurement. It survived the FY20 budget process. After that, we assume it will last another couple of FYs at least. If Trump goes, it may go. Even if Trump stays, it might not survive. Our forecast anticipates a total of 78, but it’s early in the process. It’s one thing for the Air Force to acquiesce in taking 12 per year when it also gets 48 F-35As; if the budget is cut to allow for just 48 fighters, the F-15 will have a much harder time.
Right now, our forecast assumes that someone will buy 36 more F-15s, and these are in our Undetermined forecast line. If it isn't a follow-on Qatar buy, it could be more for Saudi Arabia, or even for Singapore. Of course, they could be for the USAF. But Israel is the likeliest customer, with a reasonable chance of a 20-25 aircraft order.

All of this is conservative. The USAF could conceivably keep procurement in place, and ultimately get 144. Japan could even select the type as its F-2 replacement. But neither of these are in our forecast.

**Back at Home: Upkeep for an Amazing Legacy**

Today, the Air Force has 350 F-15Cs and 222 Es. The service has begun a “buy what you can” strategy, with money used for the 178 APG-63 (V)2/3 radar upgrades, F100-220E engine retrofits (now planned for 179 planes), ALQ-135 countermeasures, more JTIDS, and numerous other improvements. EPAWSS, a new EW system for much of the fleet, has emerged as one of the biggest programs.

Many C models will find themselves doing an attack mission, with appropriate upgrades. Many (130 as of 2018) are getting IRST pods. Many may get new wings. In the meantime, the Air Force is retiring about 170 C/Ds.

Ultimately, at least 100 Cs will get the (V)2/3 AESA radar (98 have been funded through FY17). These will stay in service through 2025 (and probably 2030) as the core “Golden Eagle” force. So will 48 Air National Guard planes, which will also get the (V)3. With the F-22 dead, the Air Force can ask for F-15 AESA radar funding without any fear of it jeopardizing its highest priority.

The alternative is to replace these older planes with the full F-15EX buy. Again, we’ll see.

As for the Strike Eagle, Boeing would like a full F-15E SLEP (probably based on the F-15K), which it may get. At the very least, it will get the new APG-82 AESA radar. This will add technology from the Super Hornet’s AESA. The LANTIRN pod will be replaced by Sniper XR or Litening II. GE is still pushing its F110 re-engining effort. But all of this depends on defense budget constraints, F-35 funding, the F-15EX, and other factors.

Our Funding Forecast has lots of cash, including well over $500 million for the radar work. And the 220+ F-15Es will stay in service through 2035, and probably beyond.
## Production Forecast

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