

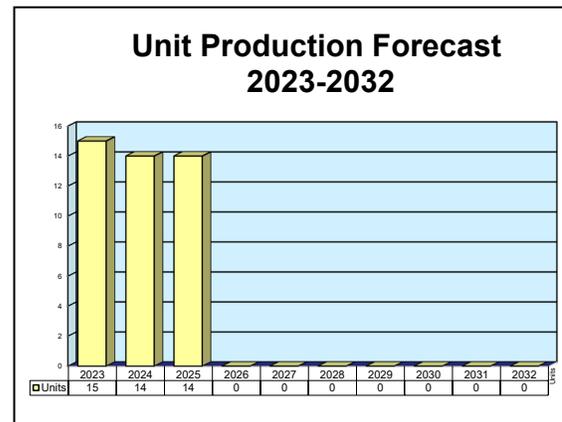
# ARCHIVED REPORT

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## ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)

### Outlook

- The U.S. Navy is expected to procure ATFLIRs alongside new-build F/A-18E/Fs through 2025
- No additional international procurement is expected
- Improved U.S. reporting on F/A-18 EO systems and a significantly revised aircraft forecast from Forecast International have led to major changes in forecasting between the 2022 and 2023 ATFLIR report



### Orientation

**Description.** The Advanced Targeting Forward-Looking Infrared (ATFLIR) sensor is used for long-range delivery of air-to-ground weapons on F/A-18 Hornet and Super Hornet aircraft.

#### Sponsor

U.S. Naval Air Systems Command (NAVAIR)  
 Patuxent River, MD  
 USA

**Status.** In production and service.

**Application.** The ATFLIR sensor was designed to enable the F/A-18 aircraft to discharge air-to-ground weapons at a safe distance from anti-aircraft artillery and many surface-to-air missiles.

**Price Range.** Forecast International estimates the price of ATFLIR to range between \$2.15 million and \$3.15 million, based on contract data. A January 2006 contract for 50 ATFLIR systems listed the price at \$1.84 million each. In December 2006, a contract for 50 pods yielded a unit price of approximately \$3.1 million. A July 2009 contract valued at \$41.8 million for 14 ATFLIR pods for the Swiss F/A-18 program yields a unit price of approximately

\$2.99 million. A December 2014 contract for 15 ATFLIRs for Australia and spares for 14 units for Switzerland was valued at \$56.8 million. Assuming around 10 percent of the contract value accounted for the spares, a unit price of \$3.4 million could be derived.

Adjusting the July 2009 contract data for inflation through July 2023 yields a unit price of approximately \$4.2 million. Meanwhile, adjusting the unit price of the December 2014 contract through July 2023 gives a unit price of \$4.4 million. It should be noted, however, the actual contemporary unit price is likely lower than these figures, since the rise in prices related to electronics tends to lag rises in overall inflation.

As of the U.S. Navy's FY23 budget, projections for the service's current ATFLIR EO/IR modernization upgrade reveal an average per-unit cost of \$2.2 million per B-kit. This estimate is the cost of the primary hardware only, and does not include any of the installation, support, software, or secondary hardware expenses. In general, the cost of an upgrade, which typically only requires the replacement of a hardware subset, is substantially lower than the cost of a full unit.

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Unit prices are generally higher for a small-quantity buy and if additional options are included, such as user-specific software, installation, training, technical engineering support, logistics, and spares.

### Contractors

#### Prime

<b>Raytheon</b>	<a href="http://www.rtx.com/raytheon">http://www.rtx.com/raytheon</a> , 2501 W University Dr, McKinney, TX 75071 United States, Tel: + 1 (972) 952-2000, Prime
<b>Boeing Defense, Space &amp; Security</b>	<a href="http://www.boeing.com/defense">http://www.boeing.com/defense</a> , PO Box 516, St Louis, MO 63166 United States, Tel: + 1 (314) 232-0232, Fax: + 1 (314) 777-1096, Packager

#### Subcontractor

<b>ARKA Danbury</b>	<a href="http://www.dmtllc.org">http://www.dmtllc.org</a> , 100 Wooster Heights Rd, Danbury, CT 06810 United States, Tel: + 1 (203) 797-5000, Fax: + 1 (203) 797-6539, Email: <a href="mailto:gail.warner@goodrich.com">gail.warner@goodrich.com</a>
<b>Abaco Systems</b>	<a href="http://www.abaco.com">http://www.abaco.com</a> , Water Ln, Towcester, Northants, United Kingdom, Tel: + 44 1327 359 444, Fax: + 44 1327 359 662, Email: <a href="mailto:ian.mcmurray@abaco.com">ian.mcmurray@abaco.com</a> (PPC4A Single Board Computers)
<b>Emerson Automation Solutions, Intelligent Platforms LLC</b>	<a href="http://www.emerson.com">http://www.emerson.com</a> , 2500 Austin Dr, Charlottesville, VA 22911-8300 United States, Tel: + 1 (314) 679-8984 (MIL-STD-1553B and Fiber-Channel PMC Mezzanine Modules)
<b>L3Harris - Communication Systems-West</b>	<a href="http://www.l3harris.com">http://www.l3harris.com</a> , 640 North 220 W, PO Box 16850, Salt Lake City, UT 84116-0850 United States, Tel: + 1 (801) 594-2000, Fax: + 1 (801) 594-3572 (ASQ-228 Datalink)
<b>Northrop Grumman Mission Systems</b>	<a href="http://www.northropgrumman.com">http://www.northropgrumman.com</a> , 600 Hicks Rd, Rolling Meadows, IL 60008-1098 United States, Tel: + 1 (847) 259-9600, Fax: + 1 (847) 870-5705, Email: <a href="mailto:contact_dsd@ngc.com">contact_dsd@ngc.com</a> (Laser Configuration Upgrade)
<b>Triumph Group Inc</b>	<a href="http://www.triumphgroup.com">http://www.triumphgroup.com</a> , 899 Cassatt Rd, Suite 210, Berwyn, PA 19312 United States, Tel: + 1 (610) 251-1000, Fax: + 1 (610) 251-1555, Email: <a href="mailto:solutions@triumphgroup.com">solutions@triumphgroup.com</a> (Flow Modulating System )

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

### Technical Data

	<u>Metric</u>	<u>U.S.</u>
<b>Dimensions</b>		
Length	183 cm	72 in
Diameter	33 cm	13 in
Weight	191 kg	420 lb
<b>Characteristics</b>		
Focal Plane	640 x 480 InSb	
Spectral Band	3.7 - 5.0 mm	0.15 - .20 in
Field of View	0.7°, 2.8°, 6.0°	
Reliability	>600 hr MTBF	
Range	> 74 km	> 40 nm
Altitude Range	> 15,240 m	> 50,000 ft

## ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)

**Design Features.** Unlike previous FLIR systems that equip the F/A-18 that attach targeting and navigational pods on opposite ends of the aircraft, the ATFLIR system combines the navigational and targeting FLIR components within one section of the aircraft. The navigation function is integrated into the adapter that connects the pod to the aircraft, and the targeting function and laser spot tracker are integrated into the pod.

ATFLIR uses third-generation mid-wave ( $3\mu\text{m}$  to  $5\mu\text{m}$ ) infrared (MWIR) targeting and navigational systems with a  $640 \times 480$  staring focal plane. Each system also

includes an electro-optical sensor, a laser rangefinder, a target designator, and a laser spot tracker.

**Operational Characteristics.** ATFLIR can locate and designate targets day or night at ranges exceeding 40 nautical miles and altitudes surpassing 50,000 feet.

Raytheon states that a key differentiator for ATFLIR is that it has a "continuously aligned" boresight, meaning that all sensors share the same optical path. This means that alignment and calibration are performed automatically and continuously.

The ATFLIR system's mean time between failures (MTBF) exceeds 600 hours.



Raytheon's ASQ-228 ATFLIR Being Installed on an F/A-18 Super Hornet

Source: U.S. Navy

## Variants/Upgrades

**Terminator.** The Terminator variant adds an onboard environmental conditioning system to the ATFLIR pod for aircraft such as the F-15 and F-16. The only other

difference between Terminator and ATFLIR is the Terminator's processor card, which converts the F/A-18 interface to an F-16 or F-15 interface.

## ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)

### Program Review

**Note:** In 2020, the ASQ-228 ATFLIR's historic manufacturer, Raytheon, merged with UTC, forming Raytheon Technologies. In order to maintain historical accuracy, this report utilizes the name of the manufacturer as it was at the time of the information being presented.

**Background.** During a Raytheon-funded test program in 1996-97, a targeting pod with a third-generation FLIR prototype was installed in an A-3 aircraft. Compared with older models, the new system had three to four times better target detection and a better recognition range.

In 1997, Boeing selected Hughes Aircraft to develop a baseline infrared system for its F/A-18E/F Super Hornet and for F/A-18C/D Hornet retrofits. That same year, Hughes merged with Raytheon.

#### *Low-Rate Production and Testing*

In 1998, Boeing awarded an ATFLIR development contract to Raytheon that included options for low-rate initial production (24 units in the first year and 33 in the second). ATFLIR replaced a BAE Systems navigation pod and the Lockheed Martin AAS-38B NITE Hawk targeting FLIR system.

ATFLIR successfully completed its first flight on an F/A-18 aircraft in 1999. But in 2000, ATFLIR was reported to have an image stabilization problem. This problem was apparently corrected, however, because in 2001 the U.S. Navy awarded a \$69.5 million contract to Boeing for LRIP of 15 ATFLIR pods. An award of roughly \$12 million followed for nonrecurring engineering efforts.

In 2002, Raytheon delivered the first production ATFLIR pod to the Navy and received a \$78 million contract to produce a batch of 28 ATFLIR pods. In the same year, the Navy reported that ATFLIR had guided a GBU-24B/B laser-guided bomb released from an F/A-18D fighter to a direct hit. The Navy deployed 12 ATFLIR-equipped F/A-18s, and three developmental variants were also reportedly deployed. The U.S. Department of Defense expressed concerns over the Navy's tendency to rush equipment to combat, but the Navy insisted that it had properly evaluated the developmental ATFLIR system and that ATFLIR had outperformed its predecessor, the NITE Hawk. The VFA-115 Super Hornet fighter squadron successfully participated in combat action while enforcing the southern Iraq no-fly zone.

In 2003, ATFLIR was deemed "operationally effective and suitable" after successfully completing an

operational evaluation and Initial Operational Capability tests. Also, Raytheon received a \$298 million contract for full-rate production of 88 pods, plus engineering support. All deliveries were completed by 2006.

The first ATFLIR-fitted F/A-18C squadron was deployed in 2004. Until this point, only F/A-18E/F fighters were equipped with ATFLIR. The Navy then received an additional \$8 million for FY05 ATFLIR buys from the Senate Armed Services Committee.

#### *Sniper and Litening Fight for Sales*

In the U.S. Air Force Advanced Targeting Pod (ATP) competition in 2001, Boeing flew the ATFLIR Terminator variant on an F-15E1 aircraft. The test flights were successful, but at the end of the competition, the Air Force chose Lockheed Martin's Sniper pod.

Following heavy lobbying by Lockheed Martin, the Navy evaluated the Sniper XR pod in 2002. The Sniper performed as expected, but the Navy decided to remain with the ATFLIR system.

#### *Competition for the International Market*

The Litening pod is ATFLIR's biggest competitor. ATFLIR lost to Litening in the Australian F/A-18 competition and failed to be selected for the Finnish Air Force F-18 midlife upgrade program. Litening was also selected for U.K. Royal Air Force (RAF) Typhoon and Tornado GR4 aircraft. However, the Sniper ATP chalked up a win with the Canadian Forces' CF-18 Hornets. This was a surprising victory for Sniper, because other Hornets are equipped with either ATFLIR or Litening pods.

#### *New Technologies*

**Ku-band.** In June 2005, Raytheon introduced a new Ku-band datalink and a sophisticated encryption system. The high-speed, "full duplex," two-way secure link allows near-instantaneous communications between aircrews and ships or ground forces. It is compliant with common datalinks, programmable for multiple data rates, and 6 to 20 times faster than C-band frequencies. Ku-band rapidly transmits and receives imagery to increase precision targeting, in addition to transmitting real-time streaming video.

Sources indicate that the Navy is interested in an ATFLIR Ku-band datalink capability; however, no contract has been awarded. In the future, Ku-band capability could be retrofitted into older pods as part of routine maintenance.

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**Laser Marker.** In September 2005, Raytheon demonstrated a new laser marker, and in June 2007 was awarded an \$18.5 million contract modification to provide the IR Laser Marker for upgrade of ATFLIR pods for F/A-18C/D and F/A-18E/F aircraft. The IR Marker upgrade was incorporated into the baseline beginning with full-rate production (FRP) Lot 4. The IR Marker allows a forward air controller (FAC) with night vision goggles to pinpoint and confirm targets that the aircrew has selected. This capability has been critical in conducting close air support (CAS), force protection, and intelligence, surveillance, and reconnaissance (ISR) operations in Iraq and Afghanistan. Raytheon is currently offering the Navy the option of retrofitting older pods with IR Laser Marker capability.

**ROVER.** Since late 2005, ATFLIR has had the ability to stream video to the Remotely Operated Video Enhanced Receiver (ROVER) on transmit-and-receive terminals carried by tactical air control ground teams. In September 2007, Bob Gower, then Boeing's vice president of F/A-18 programs, said this ability eliminates the need for ground troops to direct pilots to the location of targets. Instead, Super Hornet sensors can produce target-quality images that can be shared between pilots and ground controllers to ensure that they are looking at the same thing. The images produced by ATFLIR and the Raytheon APG-79 active electronically scanned array (AESA) can be shipped over the Super Hornet's digital communications system.

In July 2009, the Naval Air Systems Command awarded McDonnell Douglas, a wholly owned subsidiary of Boeing, a \$294,002 contract for F/A-18 ATFLIR-ROVER datalink L-band conversion kits. The related Federal Business Opportunities (FedBizOpps) notice made no mention of quantity or delivery schedule.

### *ATFLIR Plays a Supporting Role*

In December 2005, multiple Joint Direct Attack Munitions (JDAMs) were successfully delivered by a Raytheon APG-79 radar while ATFLIR provided target area imagery. The radar used real-time targeting coordinates derived from a high-resolution synthetic aperture radar (SAR) image during testing at China Lake, California. Interfacing with the APG-79, ATFLIR recorded the impact of the weapons against two diverse targets, confirming simultaneous weapon delivery while providing post-impact bomb damage information.

Raytheon reports that by using an aircraft's GPS position and attitude, ATFLIR's laser can measure the distance to a target or any point on the ground and derive the GPS coordinates of that point. This capability allows ATFLIR to target "J-class" GPS-guided weapons and generate coordinates that can be seen by other users.

In April 2007, *AirForces Monthly* reported that ATFLIR was supporting U.S. troops patrolling Baghdad neighborhoods. The reports from the battlefield were positive, and a contract for ATFLIR FRP Lot 6 was awarded in December 2007.

### *First International Sale*

In June 2008, Raytheon received a \$62 million Foreign Military Sales (FMS) contract to produce 18 pods for Australia's new F/A-18F Block II+ Super Hornet aircraft, one ATFLIR pod for Switzerland's F/A-18C Hornet upgrade program, long-lead items for units undergoing testing for Switzerland, one U.S. Navy electro-optical sensory unit, and ATFLIR spare parts. The contract included an option for up to 14 additional pods, and Switzerland exercised this option under a \$41.76 million contract issued in July 2009. This order represented a switch for Australia, where ATFLIR lost to Litening in the 2005 F/A-18 Hornet competition.

### *2009 Deliveries and Contracts*

Brad Hopper, senior business development manager at Raytheon's ISR division, Space and Airborne Systems, said in March 2009 that FRP Lot 4 deliveries of 88 pods had been completed and that Raytheon was in the process of delivering FRP Lot 5, consisting of 82 pods.

Raytheon also supports the Navy with ATFLIR components, spares, and repairs. More specifically, Raytheon signed a \$55.5 million contract for ATFLIR components in March 2009, with work due to be completed by September 2009. Additionally, an order for ATFLIR spare items was placed in September 2008. The previous month, the Navy had issued Delivery Order #0006 for the repair of various line items of ATFLIR system components.

Finally, Raytheon performs ATFLIR upgrades for the Navy. Raytheon was awarded a \$22.58 million contract in June 2009 to support the ATFLIR-IR Marker retrofit engineering change proposal (ECP). Work was scheduled to be completed in July 2010, and is believed to be finished.

## ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)

ATFLIR has been continuously deployed in support of fleet operations since June 2002, and as of December 2009 ATFLIR had marked more than 500,000 hours of operational flight on U.S. Navy F/A-18 Super Hornets.

### *Minding the Fighter Gap*

The U.S. Navy is replacing its F/A-18A/B/C/D Hornets. Development of the Hornet's replacement, the Lockheed Martin F-35C, is behind schedule, creating a possible gap in the fleet. By 2015, the USN had begun retiring Hornets faster than it could receive F-35s to replace them, creating a shortfall in the force.

Three courses of action were possible: change nothing, extend the service life of existing aircraft, and/or purchase additional Super Hornets. Any new Super Hornet purchases would result in new ATFLIR buys.

Gauging the movements of the last few years, the USN has chosen to procure more Super Hornets. In its FY11 budget, the Navy increased its total program requirement from 494 to 515 F/A-18s. In FY12 documents, the total rose to 556, and then, for FY13, to 565 aircraft. The new procurement schedule pushed the F/A-18's production out another year to FY16. Consequently, the forecast for ATFLIR production has risen and been extended.

Australia is another operator of the F/A-18 that has F-35 deliveries on its horizon. It is possible that the Australian military will follow the U.S.'s example and procure a round of Super Hornets as gapfillers. Indeed, in a military white paper released in May 2013, plans were revealed for additional F/A-18s. A further procurement of F/A-18s would, by default, entail the purchase of additional ASQ-228s, but at time of writing, information remains unclear.

### *Brazil and the Contest without End*

The Brazilian government had a long-standing fighter competition of note called F-X2. Initial selections

narrowed the field to three aircraft: the F/A-18 Super Hornet, the Saab JAS 39E/F Gripen NG, and the Dassault Rafale.

After Dilma Rousseff became president of Brazil in 2011 – taking over from Lula da Silva – the F-X2 competition was put on hold. The Brazilian government occasionally released updates as to when a winner would be announced, but dates continued to be pushed back.

If the Super Hornet had won the competition, the aircraft's production future would have been assured well into the 2020s – the same applied for the ATFLIR pod. However, after many reports named the Super Hornet as the contest's frontrunner, Brazil announced selection of the Gripen in December 2013. The announcement effectively ended the ATFLIR pod's chances of a production life extension.

### *Malaysia Retrofits with ATFLIR*

The government of Malaysia was long rumored as a potential buyer of the F/A-18E/F Super Hornet. The country had been in the midst of acquiring Sukhoi Su-30MKMs under an existing contract, but it also maintained a fleet of eight F/A-18D Hornets and 18 MiG-29s. Buying different fighters in such small batches can be an expensive approach, but with an already diverse fleet, a new Super Hornet purchase was not out of the question.

A direction was indicated, however, in May 2011, when the Defense Security Cooperation Agency (DSCA) notified the U.S. Congress of a possible FMS to Malaysia. The deal would entail upgrades to existing F/A-18D aircraft, including six ATFLIR targeting pods. Boeing received an initial contract for the upgrades in December 2011. This was followed by a December 2012 announcement of a deal with Raytheon to provide the ATFLIRs.

## Funding

### FUNDING, U.S. NAVY

	Prior <u>QTY</u>	Prior <u>AMT</u>	FY22 <u>QTY</u>	FY22 <u>AMT</u>	FY23 <u>QTY</u>	FY23 <u>AMT</u>	FY24 <u>QTY</u>	FY24 <u>AMT</u>
<b>Procurement (U.S. Navy)</b>								
<i>LI#0525 F-18 Series</i>								
Mod 2 – Advanced Targeting Forward-Looking Infrared (ATFLIR) – OSIP 12-01	-	999.399	-	10.453	-	21.449	-	4.990

**ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)**

	FY25 <u>QTY</u>	FY25 <u>AMT</u>	FY26 <u>QTY</u>	FY26 <u>AMT</u>	FY27 <u>QTY</u>	FY27 <u>AMT</u>	FY28 <u>QTY</u>	FY28 <u>AMT</u>
<i>LI#0525 F-18 Series</i>								
Mod 2 – Advanced Targeting Forward-Looking Infrared (ATFLIR) – OSIP 12-01	N/A	2.839	N/A	0.940	N/A	0.155	N/A	0.178

All \$ are in millions.

N/A = Not Available

Source: U.S. Department of the Navy, FY24 Budget Estimates, Aircraft Procurement, Navy, Volume 2, Budget Activity 5, March 2023

**Contracts/Orders & Options**

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	275.0	Mar 2005 – Mod for 80 ATFLIR FRP 3 units for F/A-18A/B/C/D/E/F aircraft for the USN/USN Reserve, plus spares and associated nonrecurring/sustaining engineering. Work was completed in Mar 2008. (N00019-03-C-0364)
Raytheon	10.6	Sep 2005 – Mod for nonrecurring engineering design and development associated with ECP No. 04270510, titled "Laser Marker," for the F/A-18 ATFLIR. Work was completed in Dec 2006. (N00019-03-C-0364)
Raytheon	10.26	Feb 2008 – Mod for CY08 integrated logistics support for the F/A-18 ATFLIR pod. Work was completed in Jan 2009. (N00019-06-C-0084)
Raytheon	22.0	Feb 2008 – Delivery Order #0005 for various line items of ATFLIR components. Work was completed in Dec 2009. (N00383-04-G-200H)
Raytheon	21.1	May 2008 – Mod P00030 to a previously awarded contract for ATFLIR line items. Work was completed in May 2010. (N00019-06-C-0310)
Raytheon	51.6	May 2008 – Mod for 19 ATFLIR pods and other hardware – specifically, for Australia (18 ATFLIR pods, \$35.6 million, 69 percent), Switzerland (1 ATFLIR, long-lead item units undergoing testing, \$5.5 million, 10.6 percent), and the U.S. Navy (1 EO sensory unit, \$10.5 million, 20.4 percent). FMS order. Work was expected to be completed by Nov 2010. (N00019-06-C-0310)
Raytheon	22.0	Aug 2008 – Delivery Order #0006 for repair of various line items of ATFLIR system components. Work was completed in Dec 2009. (N00383-04-G-200H)
Raytheon	15.8	Sep 2008 – Mod for non-recurring engineering to incorporate ECP-0035 – "EO Daylight Ops – Step 1." ECP-0035 modified the ATFLIR pods but would not incorporate them into the F/A-18 at this point. Work was completed in Sep 2010. (N00019-06-C-0310)
Raytheon	11.6	Sep 2008 – Delivery order for engineering to incorporate ECP-0038 – "Stray Light" into F/A-18E/F aircraft. ECP-0038 would be incorporated into ATFLIR production as well as the retrofit of ATFLIR pods currently on F/A-18E/F aircraft. Work was expected to be completed in Sep 2011. (N00019-06-G-0008)
Raytheon	7.9	Sep 2008 – Order for spares for F/A-18 ATFLIR systems.
Raytheon	55.5	Mar 2009 – Delivery Order #0007 for ATFLIR components. Work was completed in Sep 2009. (N00383-04-G-200H)

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<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	22.6	Jun 2009 – Delivery order for 151 EO sensor unit Weapon Replaceable Assemblies, 154 laser WRAs, 32 visible channel assemblies, and 12 visible beam splitters. Work was completed in Jul 2010. (N00019-05-G-0008)
Raytheon	41.8	Jul 2009 – Mod for 14 FRP Lot 6 ATFLIR pods and associated spares for the Swiss F/A-18 program under FMS program. Work was completed in Feb 2011. (N00019-06-C-0301)
Raytheon	9.05	Jun 2010 – FFP delivery order under a previously issued BOA for procurement of 32 EO sensor unit WRAs, laser WRAs, and laser electronic units for F/A-18 and EA-18G aircraft, supporting ATFLIR Marker retrofit ECP-04270510. Work was expected to be completed in Jul 2011. (N00019-05-G-0008)
Boeing	11.48	Jul 2010 – FFP order under a previously issued BOA for procurement of 889 ROVER datalink kits, 837 for the U.S. Navy and 52 for the Royal Australian Air Force, supporting ECP-6342 for the F/A-18E/F ATFLIR upgrade. Work was expected to be completed in Jul 2011. (N00019-05-G-0026)
Raytheon	9.80	Sep 2010 – Ceiling priced order #0001 against a previously issued basic agreement for the repair of 14 ATFLIR WRAs/Shop Replaceable Assemblies (SRAs). Work was to be completed by Dec 2011. (N00383-10-G-003D)
Boeing	17.50	Sep 2010 – CPFF contract for ECP-6375 "Operational Test Program Sets Upgrade – ATFLIR FRP Testing Capability." Work was expected to be completed in Sep 2012. (N68335-10-G-0012)
Raytheon	48.90	Dec 2010 – Ceiling-priced delivery order #0002 under previously awarded contract for repair of the ATFLIR system used in support of F/A-18 aircraft. Work was expected to be completed by Dec 2011. (N00383-10-G-006D)
Raytheon	10.43	Jun 2011 – Contract mod to exercise an option to procure supplies and services for 38 lasers and laser electronic units and 28 electro-optical sensing unit kits in support of the ATFLIR retrofit program. Work was expected to be completed in Dec 2012. (N0000-19-05-G-0008)
Raytheon	49.90	Dec 2011 – Ceiling-priced, sole-source repair delivery order under previous basic ordering agreement (BOA) for the repair of 40 ATFLIR WRAs/SRAs in support of the F/A-18. Work was expected to be completed by Dec 31, 2012. (N00383-10-G-003D)
Raytheon	14.14	Jun 2012 – Contract to produce and execute the ECP-0010R1 Electro-Optical Sensor Unit Flex Cable Set retrofit to the ATFLIR EOSU WRAs – \$2.334 million base for 28 kits with three option years (Option 1, \$3.304 million for 70 kits; Option 2, \$4.265 million for 95 kits; Option 3, \$4.210 million for 88 kits). (N0019-10-G-0006-0026)
Raytheon	9.14	Jul 2012 – FFP delivery order against a previously issued BOA for 38 ECP-04270510 IR Marker retrofit kits for the ATFLIR system on board F/A-18 aircraft. Work was completed by Mar 2014. (N00019-10-G-0006)
Raytheon	8.50	Aug 2012 – FFP delivery order against a previously issued BOA for 132 ECP-0035 EO Daylight Operations Improvement retrofit kits for the F/A-18's ATFLIR pod. Work was completed by May 2014. (N00019-10-G-0006)
Raytheon	9.87	Aug 2012 – Ceiling-priced delivery order under a previously issued BOA for the repair of nine WRAs and eight SRAs of the ATFLIR system on board the F/A-18 aircraft. Work was completed by Sep 2012. (N00383-10-G-003D-7002)

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<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	15.53	Aug 2012 – Delivery order under a previously awarded BOA for repair of two WRA and nine SRA items for the ATFLIR system. Work was expected to be completed by Aug 30, 2013. (N00383-10-G-003D)
Raytheon	25.70	Dec 2012 – FFP FMS delivery order against a previously issued BOA for six ATFLIR pods to support Malaysia's F/A-18C/D aircraft. Work was expected to be completed in Jul 2017. (N00019-10-G-0006)
Raytheon	29.00	Dec 2012 – Ceiling-priced delivery order under a BOA for the repair of 28 WRAs and 28 SRAs of the F/A-18's ATFLIR system. Work was expected to be completed in Dec 2014. (N00383-10-G-003D-7004)
Raytheon	69.00	Feb 2013 – Ceiling-priced delivery order under a previously awarded BOA for the repair of 34 WRAs and 33 SRAs for the ATFLIR system used on board the F/A-18. Work was expected to be completed by Feb 25, 2015. (N00383-10-G-003D-7005)
Raytheon	14.95	Mar 2013 – FFP delivery order under a previously issued BOA for 103 pod adapter units and NavFLIR surrogates. These are used to attach the ATFLIR pod to the F/A-18E/F. Work was expected to be completed in Nov 2015. (N00019-10-G-0006)
Northrop Grumman Systems	11.57	Jun 2013 – FFP indefinite delivery/indefinite quantity (IDIQ) contract to produce, test, integrate, qualify, and deliver an upgraded laser configuration for the EO 3rd Generation Console for the F/A-18E/F ATFLIR and SH-60 FLIR. The effort provides two production-representative units, 102 upgraded units, and associated technical data, as well as technical and logistics support for the upgrade. Work was expected to be completed in Jun 2016. (N68335-13-D-0017)
Raytheon	69.20	Dec 2013 – Ceiling-priced delivery order against a previously issued BOA for the repair of 32 WRAs and 33 SRAs of the ATFLIR system used on board the F/A-18. Work was expected to be completed by Dec 2015. (N00383-10-G-003D-7008)
Raytheon	9.43	Feb 2014 – Ceiling-priced delivery order under a previously awarded BOA for one WRA assembly and four SRA assemblies of the ATFLIR system used on board the F/A-18. Work was expected to be completed by Feb 2016. (N00383-10-G-003D-7009)
Raytheon	4.76	Apr 2014 – Modification to FFP delivery order under a BOA for ECP-0035 Step 2 EO Daylight Operations Improvement in support of the F/A-18's ATFLIR pods. The modification includes 48 "A" condition retrofits to the EOSUs. (N00019-10-G-0006-003106)
Raytheon	14.90	Jun 2014 – FFP delivery order under a previously issued BOA to complete an ECP to retrofit an IR Marker into the existing ATFLIR pods of F/A-18E/F aircraft. Work was expected to be completed by Jan 2016. (N00019-10-G-0006-0054)
Raytheon	1.32	Jun 2014 – Pricing for CY14 and CY15 input image processor (I2P), EOSU, and visible channel assembly/infrared receiver (VCA/IRR). (N00019-10-G-0006-001910)
Raytheon	64.07	Dec 2014 – Ceiling priced delivery order (#7000) against a previously issued BOA for the repair of 25 WRAs and 35 SRAs of the ATFLIR system used in support of the F/A-18. Work was expected to be completed by Dec 2016. (N00383-15-G-005D)
Raytheon	56.82	Dec 2014 – FFP delivery order (#006) against a previously issued BOA for the procurement of 15 ATFLIRs for Australia and spare parts for the government of Switzerland under an FMS program. Work was expected to be completed in Feb 2017. (N00019-10-G-0006)

**ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)**

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	11.00	Jul 2015 – FFP, CPFF delivery order (#0067) against a previously issued BOA to incorporate the EO Daylight Operations Improvement ECP into the F/A-18 ATFLIR EO sensor unit WRA. Work was expected to be completed in Dec 2016. (N00019-10-G0006)
Raytheon	68.62	Dec 2015 – CP delivery order (#7003) under a previously issued BOA for the repair of 23 WRAs and 41 SRAs of the ATFLIR system used in support of the F/A-18. Work was expected to be completed in Dec 2018. (N00383-15-G-005D)
Raytheon	56.40	Jan 2017 – FFP delivery order (#7006) under a previously awarded BOA for the repair of the ATFLIR system in support of F/A-18 aircraft. Work was scheduled to be completed in Dec 2018. (N00383-15-G-005D)
Raytheon	13.63	Sep 2017 – FFP delivery order (#1084) from a five-year BOA with no option periods for F/A-18 ATFLIR spare parts. Work was expected to be completed by Apr 30, 2021. (SPRPA1-14-G-001X)
Raytheon	54.24	Oct 2017 – FFP delivery order (#7006) under a previously awarded BOA for the repair of ATFLIRs in support of F/A-18 aircraft. Work was expected to be completed by Dec 2019. (N00383-15-G-005D)
Northrop Grumman	38.46	Jul 2018 – FFP requirements long-term contract for the repair of 17 National Item Identification Numbers under the consolidated Automated Support System Electro-Optic Console to support F/A-18 fleet repairs of ATFLIR weapon systems. Work was expected to be completed by Jul 2023. (N00383-18-D-PA01)
Raytheon, Space and Airborne Systems	7.68	Nov 2018 – CPFF delivery order (N00019-19-F-0270) under a previously issued BOA to provide for completion of ECP-0043 for the ATFLIR processor and video obsolescence avoidance system upgrade. The ECP "productionizes" the Input Image Processor Version 2 (I2P2) circuit card assembly, updates associated support test equipment, and performs I2P2 CCA qualification to enable future growth and mitigate potential obsolescence issues. Work was expected to be completed in Nov 2019. (N00019-15-G-0003)
Raytheon	65.65	Dec 2018 – FFP delivery order (N00383-19-F-HC02) under a previously issued BOA for the repair of the ATFLIR system on board F/A-18 aircraft. Work was expected to be completed by Dec 2020. (N00383-15-G-005D)
Raytheon	17.90	Oct 2019 – CPIF order (N00019-20-F-0277) under a previously issued BOA for procurement of ATFLIR special test equipment updates to Windows 10 OS. Work was expected to be completed in Feb 2022. (N00019-15-G-0003)
Raytheon	152.46	Mar 2020 – Maximum undefined FFP delivery order (SPRPA1-20-F-QD00) under a previously issued six-year contract for F/A-18 ATFLIR pod spare parts. Work is expected to be completed Mar 31, 2024. (SPRBL1-15-D-0017)
Raytheon Space and Airborne Systems	325.00	May 2020 – FFP contract for repair of the ATFLIR in support of F/A-18 aircraft. Work is expected to be completed by May 2025. (N00383-20-D-WC01)
Lockheed Martin Rotary Mission Systems	21.406	Sep 2020 -- CPIF, CPFF, Cost ID/IQ contract for procurement of EO fourth generation (EO4) console to support CASS family test systems to test, diagnose, and repair H-60 MTS and F/A-18 ATFLIR systems. Work was expected to be completed Sep 2023. (N68335-20-D-0935)

**ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)**

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	15.134	Dec 2021 – Ceiling-priced delivery order (N00383-22-F-WV01) under a previously awarded BOA for repair of ATFLIR pod unit components for F/A-18 aircraft. Work is expected to be completed by May 2025. (N00383-20-G-VW01)
Raytheon	11.163	Sep 2022 – FFP delivery order (N00383-22-F-VW07) under a previously awarded BOA for repair of ASQ-228 ATFLIR pod roll drive units and pod electronic housing components. Work is expected to be completed by Dec 2025. (N00383-20-G-VW01)
Raytheon	17.405	Sep 2022 – Ceiling-priced delivery order (N00383-22-F-VW06) under a previously awarded BOA for the purchase of ASQ-228 ATFLIR roll drive units and pod electronic housing components. Work is expected to be completed by Dec 2025. (N00383-20-G-VW01)

**Timetable**

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Nov	1997	Boeing selects Hughes Aircraft Co to develop an ATFLIR system
Dec		Hughes and Raytheon merge to create Raytheon Systems Company
Jan	2000	First of eight engineering development models delivered for testing
Mar	2001	U.S. Navy awards \$69.5 million contract to Boeing for LRIP of 15 ATFLIR sensors
Apr		Boeing flies the Terminator variant of ATFLIR on an F-15E1 aircraft
Aug		ATFLIR loses Air Force ATP program to Sniper
May	2002	Raytheon delivers the first production ATFLIR targeting pod to the U.S. Navy
Jun		ATFLIR targeting pod guides a GBU-24B/B bomb to a direct hit
Jul		First squadron of ATFLIR-equipped F/A-18 aircraft deployed
Oct	2003	Full-Rate Production approved
Dec		U.S. Navy contract for FRP of 88 ATFLIR pods (33 Lot 1 and 55 Lot 2)
Mar	2005	U.S. Navy contract for FRP of 80 ATFLIR Lot 3 units
Jan	2006	U.S. Navy contract for FRP of 50 ATFLIR Lot 4 units
Nov		Work completed on Lots 1 and 2 ATFLIR pods
Dec	2007	Work completed on Lot 3 ATFLIR pods
May	2008	Raytheon awarded first international ATFLIR contract, for Australia and Switzerland
Nov		Work completed on Lot 4 ATFLIR pods
Jun	2009	Motion Compensation and Electro-Optical Daylight Operations Improvements upgrades commence
Jul		Switzerland orders 14 FRP ATFLIR pods for F/A-18C/Ds
Nov		Work completed on Lot 5 ATFLIR pods
Jul	2010	ATFLIR reaches Full Operational Capability
Nov		Work completed on Lot 6 ATFLIR pods
Jul	2012	ATFLIR surpasses 1 million flight hours on U.S. Navy F/A-18s
Dec		Malaysia orders six ATFLIR pods for F/A-18C/Ds
	2013	Laser configuration upgrade for the ATFLIR EO 3rd Generation Console begins
	FY18	Laser improvement study (RDT&E) completed
Dec	2019	U.S. Navy Electro-Optical Daylight Operations Improvement upgrade completed
	2025	Expected end of Super Hornet production

## ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)



ATFLIR flies on board U.S. Navy F/A-18Es (mounted on lower outside corner of left air intake).

Source: U.S. Navy, Shannon Renfroe

## Worldwide Distribution/Inventories

ATFLIR targeting pods fly on U.S. Navy F/A-18E/F Super Hornet aircraft. **Australia** ordered ATFLIR pods for its F/A-18E/F Block II+ Super Hornet and EA-18G Growler aircraft. **Kuwait** has also ordered the ASQ-228 ATFLIR for F/A-18E/F Super Hornets.

**Malaysia** and **Switzerland** ordered ATFLIR pods as part of F/A-18C/D Hornet upgrade programs.

## Forecast Rationale

With the ASQ-228 ATFLIR pod's intimate ties to the F/A-18 and EA-18 fighters (collectively known as F-18s), the future of the pod is reliant on two platforms whose future production is uncertain. While recent orders and an extension of the U.S.'s F/A-18 procurement timetable have extended the life of the ATFLIR program, F-18 models are now forecast to conclude deliveries in 2025.

If no additional international contracts are obtained and the U.S. Navy ends procurement in 2025 as expected, the ATFLIR could be left with only O&M / upgrade spending as a source of income. The population of F-18 operators requiring upgrade or O&M services, though, is small, thus limiting opportunity.

In the event that the F-18s cannot attract any new operators, the U.S. Navy (the F-18 family's most prominent operator) is likely to be the sole source for any new contracts.

There are some significant changes between the 2023 ASQ-228 ATFLIR report and its previous issue. These changes should be explained to the reader.

For its FY24 budget estimates, the U.S. Navy reassigned well over \$175 million in funding that had been misrepresented as supporting the ATFLIR system to a new OSIP. In the new OSIP record, it was revealed that the funding that had previously been identified as supporting the ATFLIR was primarily supporting the F/A-18's AAQ-28 Litening pod. As such, to address the U.S. Navy's erroneous reporting, the 2023 issue of Forecast International's ASQ-228 ATFLIR report features a significantly revised O&M / upgrade forecast line versus the 2022 version.

The 2023 version of this report also features a significantly revised unit production forecast from the 2022 version. This change reflects Forecast International no longer anticipating any new F/A-18 orders from international customers. Any requirement for associated ATFLIR production is no longer anticipated, so those units have been removed from the forecast.

**ASQ-228/Advanced Targeting Forward-Looking Infrared (ATFLIR)**

**Ten-Year Outlook**

<b>ESTIMATED CALENDAR YEAR UNIT PRODUCTION</b>												
Designation or Program		High Confidence				Good Confidence			Speculative			Total
	Thru 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
<b>Raytheon Intelligence &amp; Space</b>												
<b>ASQ-228 ATFLIR &lt;&gt; United States &lt;&gt; Navy &lt;&gt; EA-18G/F/A-18 E/F</b>												
Note: Not produced on a one-for-one basis												
	596	15	14	14	0	0	0	0	0	0	0	43
<b>Total</b>	596	15	14	14	0	0	0	0	0	0	0	43
<b>ESTIMATED CALENDAR YEAR O&amp;M FUNDING (in millions US\$)</b>												
Designation or Program		High Confidence				Good Confidence			Speculative			Total
	Thru 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
<b>ASQ-228 ATFLIR &lt;&gt; United States &lt;&gt; Navy &lt;&gt; F/A-18/EA-18G &lt;&gt; Upgrade, Repair &amp; Component Contracts</b>												
Note: Repair & Upgrade												
	590.33	5.65	5.02	2.95	1.15	.17	.17	.17	.18	.18	.18	15.81
<b>Total</b>	590.33	5.65	5.02	2.95	1.15	.17	.17	.17	.18	.18	.18	15.81